Scientific and Technical Aerospace Reports

STAR

Volume 40
June 14, 2002

The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at *http://www.sti.nasa.gov*

- E-mail your question via the Internet to help@sti.nasa.gov

- Fax your question to the NASA STI Help Desk at (301) 621-0134

- Telephone the NASA STI Help Desk at (301) 621-0390

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

- NASA, NASA contractor, and NASA grantee reports;

- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms;

- Translations in report form;

- NASA-owned patents and patent applications

- Other U.S. Government agency and foreign patents and patent applications

- Domestic and foreign dissertations and theses.

Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references.

SCAN Goes Electronic!

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

Electronic SCAN takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

Timely
Flexible
Complete
FREE!

For Internet access to *E-SCAN*, use any of the following addresses:

http://www.sti.nasa.gov
ftp.sti.nasa.gov
gopher.sti.nasa.gov

Determine the SCAN topics you wish to receive and send an e-mail to **listserv@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command, denoting which topic you want and your name in the message area, formatted as follows:

Subscribe SCAN–02–01 Jane Doe

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Looking just for *Aerospace Medicine and Biology* reports?

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **Subscribe SCAN-AEROMED Jane Doe** in the message area of your e-mail to **listserv@sti.nasa.gov**.

New Feature!
subscribe
SCAN-AEROMED

Table of Contents

Subject Divisions

Document citations are grouped first by the following divisions. Select a division title to view the category-level Table of Contents.

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Document Availability

Select **Availability Info** for important information about NASA Scientific and Technical Information (STI) Program Office products and services, including registration with the NASA Center for AeroSpace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

Subject Categories of the Division A. Aeronautics

02   Aerodynamics   1

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbo-machinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03   Air Transportation and Safety   2

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.

04   Aircraft Communications and Navigation   2

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications; Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar.*

05   Aircraft Design, Testing and Performance   3

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.

06   Avionics and Aircraft Instrumentation   6

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For releead information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

07   Aircraft Propulsion and Power   6

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08   Aircraft Stability and Control   7

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09   Research and Support Facilities (Air)   7

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety.* For astronautical facilities see *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

12   Astronautics (General)   8

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20.* For extraterrestrial exploration, see *91 Lunar and Planetary Science and Exploration.*

15   Launch Vehicles and Launch Operations   9

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.*

18   Spacecraft Design, Testing and Performance   10

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see *54 Man/System Technology and Life Support.* For related information, see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.*

20   Spacecraft Propulsion and Power   11

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations;* and *44 Energy Production and Conversion.*

Subject Categories of the Division C. Chemistry and Materials

23   Chemistry and Materials (General)   11

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29.* For astrochemistry see category *90 Astrophysics.*

24 Composite Materials 12

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

25 Inorganic, Organic, and Physical Chemistry 13

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics*.

26 Metals and Metallic Materials 18

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

27 Nonmetallic Materials 18

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

28 Propellants and Fuels 19

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

Subject Categories of the Division D. Engineering

31 Engineering (General) 20

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

32 Communications and Radar 21

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation;* and *17 Space Communications, Spacecraft Communications, Command and Tracking;* for search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation and Safety*.

33 Electronics and Electrical Engineering 23

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware;* and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

34   Fluid Mechanics and Thermodynamics   27

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics.*

35   Instrumentation and Photography   31

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing.* For related information see also *06 Avionics and Aircraft Instrumentation;* and *19 Spacecraft Instrumentation.*

36   Lasers and Masers   34

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics.*

37   Mechanical Engineering   35

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support.*

38   Quality Assurance and Reliability   37

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

39   Structural Mechanics   37

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

42   Geosciences (General)   38

Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

Subject Categories of the Division F. Life Sciences

54   Man/System Technology and Life Support   81

Includes human factors engineering; bionics, man–machine, life support, space suits and protective clothing. For related information see also *16 Space Transportation* and *52 Aerospace Medicine.*.

55   Exobiology   82

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Science*.

Subject Categories of the Division G. Mathematical and Computer Sciences

59   Mathematical and Computer Sciences (General)   82

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60   Computer Operations and Hardware   83

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61   Computer Programming and Software   84

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

62   Computer Systems   96

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

63   Cybernetics, Artificial Intelligence and Robotics   97

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

64   Numerical Analysis   98

Includes iteration, differential and difference equations, and numerical approximation.

65   Statistics and Probability   99

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

Subject Categories of the Division H. Physics

Subject Categories of the Division I. Social and Information Sciences

Subject Categories of the Division J. Space Sciences

Document Availability Information

The mission of the NASA Scientific and Technical (STI) Program Office is to quickly, efficiently, and cost-effectively provide the NASA community with desktop access to STI produced by NASA and the world's aerospace industry and academia. In addition, we will provide the aerospace industry, academia, and the taxpayer access to the intellectual scientific and technical output and achievements of NASA.

Eligibility and Registration for NASA STI Products and Services

The NASA STI Program offers a wide variety of products and services to achieve its mission. Your affiliation with NASA determines the level and type of services provided by the NASA STI Program. To assure that appropriate level of services are provided, NASA STI users are requested to register at the NASA Center for AeroSpace Information (CASI). Please contact NASA CASI in one of the following ways:

> E-mail: help@sti.nasa.gov
> Fax: 301-621-0134
> Phone: 301-621-0390
> Mail: ATTN: Registration Services
> NASA Center for AeroSpace Information
> 7121 Standard Drive
> Hanover, MD 21076-1320

Limited Reproducibility

In the database citations, a note of limited reproducibility appears if there are factors affecting the reproducibility of more than 20 percent of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

NASA Patents and Patent Applications

Patents owned by NASA are announced in the STI Database. Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

Patents and patent applications owned by NASA are available for licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property
Code GP
Washington, DC 20546-0001

Sources for Documents

One or more sources from which a document announced in the STI Database is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, with an Addresses of Organizations list near the back of this section. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the citation. Current values are given in the NASA CASI Price Code Table near the end of this section.

Note on Ordering Documents: When ordering publications from NASA CASI, use the document ID number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free.

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INlS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on the Addresses of Organizations page. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Addresses of Organizations

British Library Lending Division
Boston Spa, Wetherby, Yorkshire
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

European Space Agency–
    Information Retrieval Service ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International
27 Corsham Street
London
N1 6UA
England

Fachinformationszentrum Karlsruhe
    Gesellschaft für wissenschaftlich–technische
    Information mbH
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

(NASA STI Lead Center)
National Aeronautics and Space Administration
Scientific and Technical Information Program Office
Langley Research Center – MS157
Hampton, VA 23681

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

NASA CASI Price Tables — Effective October 1, 2001
Prices are subject to change without notice

Hardcopy & Microfiche Prices			
Code	NASA	U.S.*	International*
A01	$9.50	$9.50	$19.00
A02	$13.50	$14.50	$29.00
A03	$24.50	$27.50	$55.00
A04	$27.00	$30.50	$61.00
A05	$28.50	$32.50	$65.00
A06	$31.00	$35.50	$71.00
A07	$34.50	$39.50	$79.00
A08	$37.50	$43.00	$86.00
A09	$42.50	$49.00	$98.00
A10	$45.50	$53.00	$106.00
A11	$48.50	$56.50	$113.00
A12	$52.50	$61.00	$122.00
A13	$55.50	$65.00	$130.00
A14	$57.50	$67.00	$134.00
A15	$59.50	$69.50	$139.00
A16	$61.50	$72.00	$144.00
A17	$63.50	$74.50	$149.00
A18	$67.00	$78.50	$157.00
A19	$69.00	$81.00	$162.00
A20	$71.00	$83.50	$167.00
A21	$73.00	$86.00	$172.00
A22	$78.50	$92.50	$185.00
A23	$80.50	$95.00	$190.00
A24	$82.50	$97.00	$194.00
A25	$84.50	$99.50	$199.00
A99	Contact NASA CASI		

Exception Prices			
Code	NASA	U.S.*	International*
E01	$102.50	$121.00	$242.00
E02	$111.00	$131.50	$263.00
E03	$120.50	$143.00	$286.00
E04	$130.00	$154.00	$308.00
E05	$139.50	$165.50	$331.00
E06	$148.00	$176.00	$352.00
E07	$157.50	$187.00	$374.00
E08	$167.00	$198.50	$397.00
E09	$175.50	$209.00	$418.00
E10	$185.00	$220.00	$440.00
E11	$194.50	$231.50	$463.00
E12	$202.50	$241.00	$482.00
E13	$212.00	$252.50	$505.00
E14	$221.50	$264.00	$528.00
E15	$231.00	$275.50	$551.00
E16	$239.50	$285.50	$571.00
E17	$249.00	$297.00	$594.00
E18	$258.50	$308.50	$617.00
E19	$267.00	$318.50	$637.00
E20	$276.50	$330.00	$660.00
E21	$286.00	$341.50	$683.00
E22	$294.50	$351.50	$703.00
E23	$304.00	$363.00	$726.00
E24	$313.50	$374.50	$749.00
E99	Free	Free	Free

NASA Prices:
For NASA libraries, NASA Employees
& NASA contractors registered at NASA CASI.

U.S. Prices:
For users within the U.S.

International Prices:
For users outside the U.S. and International
Embassies within the U.S.

Processing
Standard N/A
(most orders are processed within
three (3) business days, then shipped)

Rush
$10.00 per item
(orders are processed within
one (1) business day, then shipped)

Shipping & Handling Fees: per item
Standard (USPS Priority)
$2.00 U.S.
(delivered within 2-3 business days)

$7.00 International
(delivered within 4-7 business days)

USPS Express (U.S. only)
$13.00
(1-day delivery service to most destinations)

Fax (Up to 30 pages,
$16.50 U.S.
$24.00 International

Federal Express
User's Account Only _____

Federal Depository Library Program

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the Federal Regional Depository Libraries, arranged alphabetically by state, appears at the very end of this section. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

Public Collection of NASA Documents

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in the STI Database. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents FIZ–Fachinformation Karlsruhe–Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB–Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

Submitting Documents

All users of this abstract service are urged to forward reports to be considered for announcement in the STI Database. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to:

> ATTN: Acquisitions Specialist
> NASA Center for AeroSpace Information
> 7121 Standard Drive
> Hanover, MD 21076-1320.

Reprints of journal articles, book chapters, and conference papers are also welcome.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

Federal Regional Depository Libraries

ALABAMA
**AUBURN UNIV. AT MONTGOMERY
  LIBRARY**
Documents Dept.
7300 University Dr.
Montgomery, AL 36117–3596
(205) 244–3650 Fax: (205) 244–0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
P.O. Box 870266
Tuscaloosa, AL 35487–0266
(205) 348–6046 Fax: (205) 348–0760

ARIZONA
**DEPT. OF LIBRARY, ARCHIVES,
  AND PUBLIC RECORDS**
Research Division
Third Floor, State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542–3701 Fax: (602) 542–4400

ARKANSAS
ARKANSAS STATE LIBRARY
State Library Service Section
Documents Service Section
One Capitol Mall
Little Rock, AR 72201–1014
(501) 682–2053 Fax: (501) 682–1529

CALIFORNIA
CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 942837 – 914 Capitol Mall
Sacramento, CA 94337–0091
(916) 654–0069 Fax: (916) 654–0241

COLORADO
UNIV. OF COLORADO – BOULDER
Libraries – Govt. Publications
Campus Box 184
Boulder, CO 80309–0184
(303) 492–8834 Fax: (303) 492–1881

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BSG
1357 Broadway
Denver, CO 80203–2165
(303) 640–8846 Fax: (303) 640–8817

CONNECTICUT
CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566–4971 Fax: (203) 566–3322

FLORIDA
UNIV. OF FLORIDA LIBRARIES
Documents Dept.
240 Library West
Gainesville, FL 32611–2048
(904) 392–0366 Fax: (904) 392–7251

GEORGIA
UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602–1645
(706) 542–8949 Fax: (706) 542–4144

HAWAII
UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948–8230 Fax: (808) 956–5968

IDAHO
UNIV. OF IDAHO LIBRARY
Documents Section
Rayburn Street
Moscow, ID 83844–2353
(208) 885–6344 Fax: (208) 885–6817

ILLINOIS
ILLINOIS STATE LIBRARY
Federal Documents Dept.
300 South Second Street
Springfield, IL 62701–1796
(217) 782–7596 Fax: (217) 782–6437

INDIANA
INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204–2296
(317) 232–3679 Fax: (317) 232–3728

IOWA
UNIV. OF IOWA LIBRARIES
Govt. Publications
Washington & Madison Streets
Iowa City, IA 52242–1166
(319) 335–5926 Fax: (319) 335–5900

KANSAS
UNIV. OF KANSAS
Govt. Documents & Maps Library
6001 Malott Hall
Lawrence, KS 66045–2800
(913) 864–4660 Fax: (913) 864–3855

KENTUCKY
UNIV. OF KENTUCKY
King Library South
Govt. Publications/Maps Dept.
Patterson Drive
Lexington, KY 40506–0039
(606) 257–3139 Fax: (606) 257–3139

LOUISIANA
LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803–3312
(504) 388–2570 Fax: (504) 388–6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
Ruston, LA 71272–0046
(318) 257–4962 Fax: (318) 257–2447

MAINE
UNIV. OF MAINE
Raymond H. Fogler Library
Govt. Documents Dept.
Orono, ME 04469–5729
(207) 581–1673 Fax: (207) 581–1653

MARYLAND
UNIV. OF MARYLAND – COLLEGE PARK
McKeldin Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 405–9165 Fax: (301) 314–9416

MASSACHUSETTS
BOSTON PUBLIC LIBRARY
Govt. Documents
666 Boylston Street
Boston, MA 02117–0286
(617) 536–5400, ext. 226
Fax: (617) 536–7758

MICHIGAN
DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202–4093
(313) 833–1025 Fax: (313) 833–0156

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
717 West Allegan Street
Lansing, MI 48909
(517) 373–1300 Fax: (517) 373–3381

MINNESOTA
UNIV. OF MINNESOTA
Govt. Publications
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624–5073 Fax: (612) 626–9353

MISSISSIPPI
UNIV. OF MISSISSIPPI
J.D. Williams Library
106 Old Gym Bldg.
University, MS 38677
(601) 232–5857 Fax: (601) 232–7465

MISSOURI
UNIV. OF MISSOURI – COLUMBIA
106B Ellis Library
Govt. Documents Sect.
Columbia, MO 65201–5149
(314) 882–6733 Fax: (314) 882–8044

MONTANA
UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812–1195
(406) 243–6700 Fax: (406) 243–2060

NEBRASKA
UNIV. OF NEBRASKA – LINCOLN
D.L. Love Memorial Library
Lincoln, NE 68588–0410
(402) 472–2562 Fax: (402) 472–5131

NEVADA
**THE UNIV. OF NEVADA
  LIBRARIES**
Business and Govt. Information
  Center
Reno, NV 89557–0044
(702) 784–6579 Fax: (702) 784–1751

NEW JERSEY
NEWARK PUBLIC LIBRARY
Science Div. – Public Access
P.O. Box 630
Five Washington Street
Newark, NJ 07101–7812
(201) 733–7782 Fax: (201) 733–5648

NEW MEXICO
UNIV. OF NEW MEXICO
General Library
Govt. Information Dept.
Albuquerque, NM 87131–1466
(505) 277–5441 Fax: (505) 277–6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827–3824 Fax: (505) 827–3888

NEW YORK
NEW YORK STATE LIBRARY
Cultural Education Center
Documents/Gift & Exchange Section
Empire State Plaza
Albany, NY 12230–0001
(518) 474–5355 Fax: (518) 474–5786

NORTH CAROLINA
**UNIV. OF NORTH CAROLINA –
  CHAPEL HILL**
Walter Royal Davis Library
CB 3912, Reference Dept.
Chapel Hill, NC 27514–8890
(919) 962–1151 Fax: (919) 962–4451

NORTH DAKOTA
NORTH DAKOTA STATE UNIV. LIB.
Documents
P.O. Box 5599
Fargo, ND 58105–5599
(701) 237–8886 Fax: (701) 237–7138

UNIV. OF NORTH DAKOTA
Chester Fritz Library
University Station
P.O. Box 9000 – Centennial and
  University Avenue
Grand Forks, ND 58202–9000
(701) 777–4632 Fax: (701) 777–3319

OHIO
STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43215–4163
(614) 644–7051 Fax: (614) 752–9178

OKLAHOMA
OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Division
200 Northeast 18th Street
Oklahoma City, OK 73105–3298
(405) 521–2502, ext. 253
Fax: (405) 525–7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Stillwater, OK 74078–0375
(405) 744–6546 Fax: (405) 744–5183

OREGON
PORTLAND STATE UNIV.
Branford P. Millar Library
934 Southwest Harrison
Portland, OR 97207–1151
(503) 725–4123 Fax: (503) 725–4524

PENNSYLVANIA
STATE LIBRARY OF PENN.
Govt. Publications Section
116 Walnut & Commonwealth Ave.
Harrisburg, PA 17105–1601
(717) 787–3752 Fax: (717) 783–2070

SOUTH CAROLINA
CLEMSON UNIV.
Robert Muldrow Cooper Library
Public Documents Unit
P.O. Box 343001
Clemson, SC 29634–3001
(803) 656–5174 Fax: (803) 656–3025

UNIV. OF SOUTH CAROLINA
Thomas Cooper Library
Green and Sumter Streets
Columbia, SC 29208
(803) 777–4841 Fax: (803) 777–9503

TENNESSEE
UNIV. OF MEMPHIS LIBRARIES
Govt. Publications Dept.
Memphis, TN 38152–0001
(901) 678–2206 Fax: (901) 678–2511

TEXAS
TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 – 1201 Brazos
Austin, TX 78701–0001
(512) 463–5455 Fax: (512) 463–5436

TEXAS TECH. UNIV. LIBRARIES
Documents Dept.
Lubbock, TX 79409–0002
(806) 742–2282 Fax: (806) 742–1920

UTAH
UTAH STATE UNIV.
Merrill Library Documents Dept.
Logan, UT 84322–3000
(801) 797–2678 Fax: (801) 797–2677

VIRGINIA
UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
University Ave. & McCormick Rd.
Charlottesville, VA 22903–2498
(804) 824–3133 Fax: (804) 924–4337

WASHINGTON
WASHINGTON STATE LIBRARY
Govt. Publications
P.O. Box 42478
16th and Water Streets
Olympia, WA 98504–2478
(206) 753–4027 Fax: (206) 586–7575

WEST VIRGINIA
WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069 – 1549 University Ave.
Morgantown, WV 26506–6069
(304) 293–3051 Fax: (304) 293–6638

WISCONSIN
**ST. HIST. SOC. OF WISCONSIN
  LIBRARY**
Govt. Publication Section
816 State Street
Madison, WI 53706
(608) 264–6525 Fax: (608) 264–6520

MILWAUKEE PUBLIC LIBRARY
Documents Division
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 286–3073 Fax: (414) 286–8074

Typical Report Citation and Abstract

❶ **19970001126**   NASA Langley Research Center, Hampton, VA USA

❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**

❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;

❹ Mar. 1996; 130p; In English

❺ Contract(s)/Grant(s): RTOP 505-68-70-04

❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

❼   To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10' to 50', and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65' swept forebody serrations tended to roll together, while vortices from 40' swept serrations were more effective in generating additional lift caused by their more independent nature.

❽ Author

❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1.   Document ID Number; Corporate Source
2.   Title
3.   Author(s) and Affiliation(s)
4.   Publication Date
5.   Contract/Grant Number(s)
6.   Report Number(s); Availability and Price Codes
7.   Abstract
8.   Abstract Author
9.   Subject Terms

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20020044101 National Aerospace Lab., Amsterdam, Netherlands
MANTEA Departure Sequencer: Increasing Airport Capacity by Planning Optimal Sequences
Heselink, H. H.; Basjes, N.; 2002; 28p; In English
Contract(s)/Grant(s): CEC-TR-1036
Report No.(s): PB2002-103220; NLR-TP-99279; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    In this paper, the authors present a planning decision support tool for airport tower controllers. The tool assists controllers in the establishment of optimal departure sequences and the planning of initial climb phases. Airports are getting more and more congested with their available runway configuration as one of the most constraining factors. One of the possibilities to alleviate this congestion is to assist controllers in the planning process. In this paper, the authors focus on runway departure planning, but nevertheless show that this should not be a stand alone process. Department planning must be seen as part of an integrated and cooperative decision making environment.
NTIS
Airport Planning; Controllers; Decision Making; Air Traffic Control; Decision Support Systems

20020044748 Oklahoma State Univ., Coll. of Engineering, Architecture and Technology, Stillwater, OK USA
Current Progress of a Finite Element Computational Fluid Dynamics Prediction of Flutter for the AeroStructures Test Wing *Progress Report*
Arena, Andrew S., Jr., Oklahoma State Univ., USA; [2002]; 12p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG4-216
Report No.(s): OSU-AA-5-64211; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    This progress report focuses on the use of the STructural Analysis RoutineS suite program, SOLIDS, input for the AeroStructures Test Wing. The AeroStructures Test Wing project as a whole is described. The use of the SOLIDS code to find the mode shapes of a structure is discussed. The frequencies, and the structural dynamics to which they relate are examined. The results of the CFD predictions are compared to experimental data from a Ground Vibration Test.
Author
Computational Fluid Dynamics; Finite Element Method; Flutter Analysis; Wings; Aircraft Structures

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20020044128 Federal Aviation Administration, Flight Standards Service, Washington, DC USA

Federal Aviation Administration: Aviation Safety Counselor Manual

Jun. 17, 1996; 61p; In English

Report No.(s): AD-A400335; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

   The mission of the Aviation Safety Counselor program is to support the Federal Aviation Administration's Aviation Safety Program in promoting and fostering aviation safety. This program encompasses all elements of the aviation community. The Federal Aviation Act of 1958 stipulates the mission of the Federal Aviation Administration (FAA). It says, in part, 'The Administrator shall regulate air commerce in such a manner as to best promote its development and safety'. Our Aviation Safety Program (ASP) is supported by the Office of the Administrator and the strength of the entire FAA. The program encourages total involvement of the aviation community. Representatives of all segments of the aviation industry are encouraged to participate with the FAA in the conduct of workshops and seminars designed to broaden and refresh technical knowledge. There are Safety Program Managers (SPM's) assigned to each Flight Standards District Office to organize ASP activities. There are over 3,000 volunteers serving as Aviation Safety Counselors (ASC's), sharing their technical expertise and professional knowledge with the aviation community. This document describes the safety program and provides guidance to volunteer counselors in the performance of their duties and responsibilities in support of the program. The FAA established the ASP on the premise that accident rates could be reduced by encouraging members of the aviation community to improve their attitudes toward safety by refreshing their aeronautical knowledge and by improving their aeronautical skills. The ASP began as the brainchild of James (Pete) Campbell, former Flight Standards Division Manager and the program's first national coordinator. Although the position, title and headquarters parent organization has changed several times since 1970, our mission has remained the same: to enhance aviation safety through public education.

DTIC

Education; Flight Safety; Aircraft Safety

20020044537 Hughes Technical Center, Atlantic City International Airport, NJ USA

History and Interpretation of Aircraft Icing Intensity Definitions and FAA Rules for Operating Icing Conditions *Final Report*

Jeck, R. K.; Nov. 2001; 50p; In English

Report No.(s): PB2002-103127; DOT/FAA/AR-01/91; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   This report traces the evolution of aircraft icing severity definitions and of the Federal Aviation Administration (FAA) regulations governing flight in icing conditions in order to understand the intent of each and how they relate to each other. There have been several changes in both the definitions and the regulations over time, and part of the problem is that the definitions have not been updated or clarified to account for current regulations. Much confusion has resulted and, in order to improve the situation, new and updated definitions have been recently proposed by a new working group established as part of the 1997 FAA In-Flight Icing Plan.

NTIS

Ice Prevention; Aircraft Icing; Definition

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20020044632 San Jose State Univ., Moffett Field, CA USA

Identification of Error Patterns in Terminal-Area ATC Communications

Quinn, Cheryl, San Jose State Univ., USA; Walter, Kim E., San Jose State Univ., USA; [1997]; 1p; In English; 41st Annual

Meeting of the Human Factors and Ergonomics Society, 22-26 Sep. 1997, Albuquerque, NM, USA; Sponsored by Human Factors and Ergonomics Society, USA

Contract(s)/Grant(s): NCC2-327; Copyright; Avail: Issuing Activity; Abstract Only

Advancing air traffic management technologies have enabled a greater number of aircraft to use the same airspace more effectively. As aircraft separations are reduced and final approaches are more finely timed, there is less room for error. The present study examined 122 terminal-area, loss-of-separation and procedure violation incidents reported to the Aviation Safety Reporting System (ASRS) by air traffic controllers. Narrative description codes were used for the incidents for type of violation, contributing factors, recovery strategies, and consequences. Usually multiple errors occurred prior to the violation. Error sequences were analyzed and common patterns of errors were identified. In half of the incidents, errors were noticed in time to correct mistakes. of these, almost 43% committed additional errors during the recovery attempt. This analysis shows that redundancies in the present air traffic control system may not be sufficient to support large increases in traffic density. Error prevention and design considerations for air traffic management systems are discussed.

Author (revised)

Air Traffic Control; Airspace; Error Analysis; Flight Management Systems

20020044744 Physics and Electronics Lab. TNO, The Hague, Netherlands

Long Distance Communication Specific for the Apache Longbow *Final Report Langeafstandscommunicatie Specifiek voor de Apache Longbow*

Diaz, I. Fernandez, Physics and Electronics Lab. TNO, Netherlands; vanDam, C., Physics and Electronics Lab. TNO, Netherlands; Overduin, R., Physics and Electronics Lab. TNO, Netherlands; Hoefsloot, P. C., Physics and Electronics Lab. TNO, Netherlands; Ponsioen, C., Physics and Electronics Lab. TNO, Netherlands; January 2002; 58p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 015.29431

Report No.(s): TD-01-0256; FEL-01-A312; Copyright; Avail: Issuing Activity

This report deals with the long distance communication means on board the Apache (Longbow) helicopter. From an operational scenario analysis, it is concluded that this platform needs to establish communication links over distances of 60-200 km., which is not possible with the current communication means on board. to fulfil this requirement, two alternatives are proposed and studied: HF communication and satellite communication. The best candidate to fulfil the requirement for the Apache (Longbow) helicopter, especially in the short term, appeared to be HF communication.

Author

Satellite Communication; Communication Networks; Helicopters

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020044120 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia

Probabilistic Design of Damage Tolerant Composite Aircraft Structures *Final Report*

Ushakov, A.; Stewart, A.; Mishulin, I.; Pankov, A.; Jan. 2002; 212p; In English

Contract(s)/Grant(s): FAA-NAT-13413

Report No.(s): PB2002-103129; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The present document describes the efforts under Memorandum of Cooperation between the Federal Aviation Administration (FAA), USA, and the Central Aero-Hydrodynamic Institute (TsAGI), Russian Federation. Under this effort, a methodology for calculating reliability of composite aircraft structures was developed and is contained in the software Probabilistic Design of Damage Tolerant Composite Structures (ProDeCompoS). In addition, background data culled from Russian usage of composite

aircraft structures was compiled to use with ProDeCompoS. The data includes statistical data of damage occurrence, effectiveness of repair, and test data and computational methods to determine residual strength for damaged composite laminate.

NTIS

Aircraft Structures; Composite Materials; Composite Structures; Durability; User Manuals (Computer Programs); Structural Design

20020044432 NASA Ames Research Center, Moffett Field, CA USA

New Concepts and Perspectives on Micro-Rotorcraft and Small Autonomous Rotary-Wing Vehicles

Young, Larry A., NASA Ames Research Center, USA; Aiken, E. W., NASA Ames Research Center, USA; Johnson, J. L., Aerospace Computing, Inc., USA; Demblewski, R., San Mateo Coll., USA; Andrews, J., Massachusetts Inst. of Tech., USA; [2001]; 16p; In English; 20th AIAA Applied Aerodynamics Conference, 24-27 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 712-10-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

    A key part of the strategic vision for rotorcraft research as identified by senior technologists within the Army/NASA Rotorcraft Division at NASA Ames Research Center is the development and use of small autonomous rotorcraft. Small autonomous rotorcraft are defined for the purposes of this paper to be a class of vehicles that range in size from rotary-wing micro air vehicles (MAVs) to larger, more conventionally sized, rotorcraft uninhabited aerial vehicles (UAVs) - i.e. vehicle gross weights ranging from hundreds of grams to thousands of kilograms. The development of small autonomous rotorcraft represents both a technology challenge and a potential new vehicle class that will have substantial societal impact for: national security, personal transport, planetary science, and public service.

Derived from text

Autonomy; Rotary Wing Aircraft

20020044503 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Multiple Ant Colony Metaheuristic for the Air Refueling Tanker Assignment Problem

Annaballi, RonJon; Mar. 2002; 98p; In English

Report No.(s): AD-A400201; AFIT/GOR/ENS/02-01; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

    A key tenet to the Air Force's vision of Global Vigilance, Reach, and Power is the ability to project power via the use of aerial refueling. Scheduling of limited tanker resources is a major concern for Air Mobility Command (AMC). Currently the Combined Mating and Ranging Planning System (CMARPS) is used to plan aerial refueling operations, however due to the complex nature of the program and the length of time needed to run a scenario, the need for a simple tool that runs in much shorter time is desired. Ant colony algorithms are recently developed heuristics for finding solutions to difficult optimization problems based on simulation the foraging behavior of ant colonies. It is a distributive metaheuristic that combines an adaptive memory function with a local heuristic function to repeatedly construct possible solutions which can then be evaluated. Using multiple ant colony heuristics combined with a simple scheduling algorithm and modeling the Tanker Assignment Problem as a modified Multiple Depot Vehicle Routing Problem, an Excel based spreadsheet tool was developed which generates very good solutions in very short time.

DTIC

Heuristic Methods; Air to Air Refueling; Spreadsheets

20020045318 Oklahoma Univ., School of Aerospace Mechanical and Nuclear Engineering, Norman, OK USA

Fatigue and Fracture Characterization of Aircraft Aluminum Alloys Damaged by Prior Corrosion *Final Report, 1 Nov. 1997-31 May 2001*

Baldwin, J. D.; Mar. 19, 2002; 58p; In English

Contract(s)/Grant(s): F49620-98-1-0050

Report No.(s): AD-A400498; AFRL-SR-BL-TR-02-0733; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

    At the time of the initiation of this project, there was no comprehensive data describing corrosion's effect on the fatigue and fracture behavior of aluminum alloys typically found in aging aircraft. One of the primary objectives of this project was to perform experimental and analytic characterizations of these materials response for three aluminum alloys (2024-T3, 7075-T6 and 7178-T6, all widely used in order aircraft) in the presence of prior corrosion. Because the typical aircraft's operation cycle leads to the supposition that corrosion and fatigue are series events (as opposed to simultaneous corrosion and fatigue), we made experimental test specimens that had artificially-grown corrosion damage in them. The aim was to develop the necessary material response data to be used in structural integrity inspection interval determinations. Specifically, fatigue crack growth rates and fracture toughness data were developed. For each alloy, the experimental variables were material condition (ranging from no

corrosion through several degrees of damage), stress ratio and relative humidity in the air environment. Here, we quantified corrosion damage as the percent of material lost, based on the nominal specimen thickness. A multiple replication factorial experimental design provided the data and analysis of variance techniques were used to address the hypotheses that the experimental variables affect the crack growth rates and that any observed differences can be accounted for by considering only the thickness reduction caused by corrosion. For each alloy, crack growth rate relationships (e.g., da/dN versus delta K) were developed that account for corrosion damage. The fracture characterization focused on the plane stress fracture toughness values (K(sub c)) for varying levels of corrosion damage and varying specimen.
DTIC

Aluminum Alloys; Corrosion; Crack Propagation; Damage; Fatigue (Materials); Mechanical Properties

20020045496 White Sands Missile Range, NM USA
Temperature-Altitude Tests for Missile System and Missile Subsystem Equipment *Final Report*
Jan. 08, 2002; 36p; In English
Report No.(s): AD-A400694; TOP-5-2-582; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This TOP provides guidance for determining the ability of equipment under test to operate and the ability of the equipment materiel to withstand exposure to various temperature-altitude environments. Temperature-altitude tests are one of a series of possible environmental tests conducted to ensure the reliability of a missile system. The tests described herein include the probable extreme temperature-altitude conditions to which a missile system may be exposed. In addition, these tests will permit determination of materiel degradation, if any. The range of environmental conditions is not limited to those of the intended tactical emplacement of the equipment, but includes those which might be encountered during the item's life cycle including transportation and storage (without protective packaging).
DTIC

Altitude Tests; Missile Systems; Equipment; Thermodynamic Properties

20020045507 RAND Corp., Arroyo Center, Santa Monica, CA USA
Analysis of Air-Based Mechanization and Vertical Envelopment Concepts and Technologies
Grossman, Jon; Matsumura, John; Steeb, Randall; Gordon, John; Herbert, Tom; Sollfrey, William; Jan. 2001; 102p; In English
Contract(s)/Grant(s): DASW01-96-C-0004
Report No.(s): AD-A400744; RAND/DB-321-A; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This document summarizes research conducted in 1998 by the RAND Arroyo Center on an exploration and assessment of the ability to insert mechanized forces in enemy-controlled terrain. RAND specifically investigated the use of tilt-rotor aircraft for vertical envelopment concepts, with particular emphasis on survivability implications and the potential enabling role that technology can play. The vertical envelopment concept used for this study was that of rapid deployment of an air-mechanized Army After Next (AAN) battle force into ambush positions against the second echelon of an invading Red force. The work involved the application of high-resolution, force-on-force simulation for the quantitative analysis. Although the research was conducted prior to the Army's current transformation efforts and used a conventional Russian-based threat, it can still provide useful insights into some of the challenges of tomorrow's nonlinear battlespace. The results of the research should be of interest to defense policymakers, concept and materiel developers, and technologists. We note that the air-mechanized (air-mech) battle force design and employment concept used in this study represented the work of the AAN study project in the FY96-98 timeframe and has no relationship to the current "Air-Mech" concepts proposed by BC (ret.) David Grange and others.* The "battle force" was a notional design construct used by AAN to analyze possible future organizational constructs without the constraints of current unit paradigms. The air-mech concept explored was the organic capability, within a battle force, to air maneuver both troops and medium-weight combat systems at both tactical and operational depths. TRADOC's Army Transformation Study, Wargaming, and Analysis effort has replaced the idea of organic operational airlift of systems with a more general-purpose capability for external lift assets (Army and/or joint) to enable operational maneuver by Objective Force units.
DTIC

Tilt Rotor Aircraft; Deployment; Mechanization

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020044102 National Aerospace Lab., Amsterdam, Netherlands
Competence Management with EuroSim Centered CACE Working Environments
tenDam, A. A.; Groothuizen, R. J. P.; Jun. 1998; 28p; In English
Report No.(s): PB2002-103219; NLR-TP-98249; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   There is a growing need to handle large aerospace projects in a systematic manner: transfer of knowledge between people on a case by case manner is a time-consuming and costly process. Computer based simulation is recognized as one of the tools that can support production cycles leading to shorter development times. Usually aerospace projects are executed in international teams where companies are responsible for specific subsystems. Nowadays, it has become essential that cooperating engineers and managers can use computer networks where software tools and software models can be accessed easily. With simulation comes the opportunity to reuse existing knowledge and the need to preserve newly acquired knowledge in a structured way. The necessity for working environments in which the computer network can be used as one virtual computer is apparent. Working environments allow engineers to concentrate on a task at hand and at the same time shield information that is not relevant for users. Working environments are useful also across boundaries of projects as they facilitate technical cross-fertilization. At the National Aerospace Laboratory NLR, the SPINE system is used for construction and operational use of functionally integrated working environments. Working environments can be made suitable for specific engineering goals, such as Computer Aided Control Engineering (CACE) by incorporating specific engineering tools. EuroSim, a generic and highly configurable simulator tool, is such an engineering tool.
NTIS
Computer Aided Design; Computer Networks; Aerospace Engineering; Simulators

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

20020045322 Serck Radiators Ltd., Birmingham, UK
Design of Compact Heat Exchangers for Aero-Gas Turbines
Payne, Stan, Serck Radiators Ltd., UK; Hughes, Steve, Serck Radiators Ltd., UK; Allen, Alex, Serck Radiators Ltd., UK; May 30, 2001; 17p; In English; Original contains color images; See Also ADM001348, Thermal Materials Workshop 2001, held in Cambridge, UK on May 30-June 1, 2001. The original document contains color images. Contains viewgraphs only. Additional papers can be downloaded from: http://www-mech.eng. cam.ac.uk/onr/
Report No.(s): AD-A400631; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   To increase heat transfer heat exchanger use nickel or aluminum foam. Company has several design under consideration. Development of product rapidly expected.
CASI
Heat Transfer; Heat Exchangers; Metal Foams

20020045529 RAND Corp., Santa Monica, CA USA
Alternatives for Jet Engine Intermediate Maintenance
Amouzegar, Mahyar A.; Galway, Lionel A.; Geller, Amanda; Jan. 2002; 97p; In English
Contract(s)/Grant(s): F49642-01-C-0003
Report No.(s): AD-A400829; RAND/MR-1431-AF; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

   This report documents research undertaken in support of emerging Air Force employment strategies associated with the Expeditionary Aerospace Force (EAF). EAF concepts turn on the premise that rapidly tailorable, quickly deployable, immediately employable, and highly effective air and space force packages can serve as a credible substitute for permanent forward presence.

The success of the EAF will depend, to a great extent, on the effectiveness and efficiency of the Agile Combat Support (ACS) system. This study is one of a series of RAND reports that address ACS issues in implementing the EAF.
DTIC
Aerospace Systems; Support Systems; Combat

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20020045473 West Virginia Univ., Mechanical and Aerispace Engineering Department, Morgantown, WV USA
YF22 Model With On-Board On-Line Learning Microprocessors-Based Neural Algorithms for Autopilot and Fault-Tolerant Flight Control Systems *Final Report*
Napolitano, Marcello R., West Virginia Univ., USA; Mar. 2002; 233p; In English
Contract(s)/Grant(s): F49620-98-1-0136
Report No.(s): AD-A400639; AFRL-SR-BL-TR-02-0103; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This project focused on investigating the potential of on-line learning 'hardware-based' neural approximators and controllers to provide fault tolerance capabilities following sensor and actuator failures. Following a phase of simulation studies a set of selected architectures for neural estimators and neural controllers were flown on a semi-scale YF-22 aircraft model. The YF-22 model was designed, built, and flown at research facilities at West Virginia University. Additionally, a customized electronic payload featuring these fault tolerant schemes was designed, built, tested and interfaced with the YF-22 flight control system. A series of 33 flight tests were conducted with the aircraft; the flight data confirmed the potential of neural estimators and controllers for fault tolerance purposes. Another research objective was to start addressing system requirements leading to the problem of software validation and verification for this new class of algorithms for fault tolerant flight control systems.
DTIC
Neural Nets; Flight Control; Fault Tolerance; On-Line Systems; Program Verification (Computers); Scale Models

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20020045491 Defence and Civil Inst. of Environmental Medicine, Toronto, Ontario Canada
Assessing Intelligent Software Agents for Training Maritime Patrol Aircraft Crews
Grant, Stuart C.; Dec. 2001; 36p; In English
Report No.(s): AD-A400717; DCIEM-TR-2001-036; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Training simulators often require the participation of several people to play the role of supporting players in the simulated operation. Use of intelligent software agents to play the role of these personnel has the potential to reduce support staff and increase an instructor's control of training. This report evaluates a simulator prototype developed for the CP140 Aurora maritime patrol aircraft that incorporated intelligent software agents to play the roles of the Tactical Navigator and an Acoustic Sensor Operator. Human crews, intelligent agent crews, and mixed human-agent crews performed a simulated antisubmarine mission. Mission performance and crew communications were recorded and rated to determine whether the intelligent software agents could perform individual crewmember functions and whether they could provide the interaction necessary for crew coordination training. The results indicate that: (1) agents can perform individual crewmembers' functions; (2) agent interaction with humans is sufficient to allow humans to perform their own tasks; and (3) the agents did not interact in a way suitable for crew coordination training. It is concluded that the prototype is suitable for supporting individual training, but the agents' knowledge base must explicitly address team dynamics if crew coordination training is to be supported.
DTIC
Flight Crews; Patrols; Training Simulators; Software Engineering

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20020045471 Air Force Space Command, Peterson AFB, CO USA
A Space Blockade Flexible and Responsive Denial of Adversary Use of Space
Fabian, Robb; Apr. 03, 2001; 31p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images
Report No.(s): AD-A400680; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   These briefing slides deal with the military value of space, military applications in space environments, global communications, space threat, the space blockade process and conclusion to the problem.
DTIC
Aerospace Environments; Technology Utilization; Space Exploration; Military Operations

20020045472 Air Force Space Command, Peterson AFB, CO USA
A Space Blockade; Flexible and Responsive Denial of Adversary Use of Space
Fabian, R. A.; Riebe, T.; Apr. 03, 2001; 10p; In English; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. Prepared in collaboration with Analytic Services, Arlington, VA
Report No.(s): AD-A400663; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   From the earliest days of space exploration, space has been used for military purposes. This use has ranged from imagery for reconnaissance, such as the recently declassified Project Corona, weather, and terrain mapping to long range communications and the more recent innovations from precision navigation. Over the past few decades, space has proven itself a superior force multiplier. America's extensive investments in military space systems paid off demonstrably in OPERATION DESERT STORM and OPERATION ALLIED FORCE. The Department of Defense Space Policy calls space a strategic enabler and calls it a necessary precursor to the way we fight wars on land, at sea, and in the air. We have, perhaps, reached the point where we take the need for space support in battle as a given. But if it is so obvious to us that we need space to fight, what must the rest of the world be thinking? There is nothing uniquely American about space that prevents the rest of the world from learning from our example.
DTIC
Military Operations; Aerospace Systems; Mapping

20020045531 Space Warfare Center, Analysis and Engineering Div., Schriever AFB, CO USA
Space Battlelab's High Accuracy Satellite Drag Model
Storz, Mark F.; Bowman, Bruce R.; Branson, James I.; Apr. 2001; 12p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images
Report No.(s): AD-A400836; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The High Accuracy Satellite Drag Model is a new initiative launched by the Air Force Space Battlelab in January 2001 to improve Air Force Space Command's ability to meet the stringent Space Surveillance Capstone Requirements for satellite trajectory prediction accuracy. For low perigee satellites, these requirements are not consistently met, largely because of current atmospheric density model errors of 15 to 20% 6. This can affect missions like high-precision sensor acquisition of satellites, maneuver planning, re-entry predictions, collision avoidance and risk analysis. The Space Battlelab decided to fund this initiative because of the substantial pay-back expected, and the fact that it involves more risk than the acquisition community or operational community are willing to fund. It is also well suited to the Space Battlelab's project criteria of demonstrating unconventional ways of using existing data and technology to meet mission requirements and being able to demonstrate this in less than 18 months. Finally, this initiative leverages off an earlier Space Battlelab project that demonstrated the promise the basic technique holds, even when only one satellite is used to determine the drag effects.
DTIC
Spacecraft Trajectories; Atmospheric Models; Mission Planning; Trajectories

20020045532 Air Force Space Command, Peterson AFB, CO USA

HQ AFSPC Space Superiority Through Space Control

Pavlovich, J. G.; Apr. 2001; 34p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images

Report No.(s): AD-A400833; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These briefing slides present the topic that the U.S. must develop the means both to deter and defend against hostile acts in and from space.

DTIC

Defense; Chutes; Aerospace Environments

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20020045392 NASA Marshall Space Flight Center, Huntsville, AL USA

Natural Atmospheric Environment Model Development for the National Aeronautics and Space Administration's Second Generation Reusable Launch Vehicle

Roberts, Barry C., NASA Marshall Space Flight Center, USA; Leahy, Frank, Raytheon Co., USA; Overbey, Glenn, Raytheon Co., USA; Batts, Glen W., Computer Sciences Corp., USA; [2002]; 3p; In English; 9th Conference on Aviation, Range and Aerospace Meteorology, 13-16 May 2002, Portland, OR, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The National Aeronautics and Space Administration (NASA) recently began development of a new reusable launch vehicle. The program office is located at Marshall Space Flight Center (MSFC) and is called the Second Generation Reusable Launch Vehicle (2GRLV). The purpose of the program is to improve upon the safety and reliability of the first generation reusable launch vehicle, the Space Shuttle. Specifically, the goals are to reduce the risk of crew loss to less than 1-in-10,000 missions and decreased costs by a factor of 10 to approximately $1,000 per pound of payload launched to low Earth orbit. The program is currently in the very early stages of development and many two-stage vehicle concepts will be evaluated. Risk reduction activities are also taking place. These activities include developing new technologies and advancing current technologies to be used by the vehicle. The Environments Group at MSFC is tasked by the 2GRLV Program to develop and maintain an extensive series of analytical tools and environmental databases which enable it to provide detailed atmospheric studies in support of structural, guidance, navigation and control, and operation of the 2GRLV.

Author

Atmospheric Models; Reusable Launch Vehicles; Technology Utilization

20020045483 Kyunghee Univ., Taejon, Korea, Republic of

Spectroscopic Observations of Satellites at Kyung-Hee University in Korea

Lee, Dong K.; Kim, Sang J.; Apr. 2001; 8p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held at Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images

Report No.(s): AD-A400789; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have been conducting spectroscopic observations of satellites in addition to photometric observations since last summer at the Kyung-Hee Optical Satellite Observation and Tracking Facility (KOSOTF). We began with observing slowly moving objects, such as geo-stationary satellites. We have undergone many trials and errors to succeed in the spectroscopic observations of these satellites. Necessary hardware and software being used are described. Observation and data acquisition techniques are also discussed although data analyses have not been completed. Future observing plans are presented for the spectroscopic and photometric observations of low altitude satellites.

DTIC

Photometry; Satellite Observation; Spectroscopy; Synchronous Satellites

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20020045490 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Exploiting AFSCN Ranging Data for Catalog Maintenance
Coster, A. J.; Abbot, R.; Thornton, L. E.; Durand, D.; Apr. 03, 2001; 10p; In English; Original contains color images; See also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images
Report No.(s): AD-A400718; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Air Force Satellite Control Network (AFSCN) is composed of eight worldwide fixed remote tracking stations (Space Ground Link Stations, SGLS) hosting 15 antennas, plus two mission control nodes, one at Onizuka AFB, CA and the other at Schriever AFB, CO. One of the AFSCN message formats provides AFSCN metric data (range, range-rate, azimuth, and elevation). Currently the AFSCN metric data are not used by the Space Control Center for catalog maintenance. AFSCN satellite data are received at a central processing facility and immediately diverted to the particular Space Operation Squadron (SOPS) in charge of the satellite. Element sets are produced by the SOPS, but the resulting element sets are not in a format usable by Space Command, and no procedure is in place to transfer them to Cheyenne Mountain. There are several advantages to incorporating the AFSCN data into the Space Control Center (SCC) catalog. The AFSCN range measurement is accurate to the 1-meter level, if the site locations are precisely determined and if atmospheric corrections and carefully calibrated transponder and site biases are applied. This paper describes the Lincoln Laboratory effort to make the AFSCN ranging data available to the SCC for use in both catalog maintenance and, since the data is of such high quality, for use in the separate special perturbations catalog at the Mountain. The specific plan for obtaining the AFSCN data, calibrating it in near real-time, reformatting the observations for submission to Space Command, and transmitting the data to Cheyenne Mountain will be described in detail.
DTIC
Satellite Networks; Catalogs (Publications); Maintenance; Satellite Control; Rangefinding

20020045502 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Exploiting AFSCN Ranging Data for Catalog Maintenance
Coster, A. J.; Abbot, R.; Thornton, L. E.; Durand, D.; Apr. 03, 2001; 27p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images
Report No.(s): AD-A400706; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The following topics are covered in this briefing: 1) Lincoln Experience with AFSCN data, 2) Calibration Issues, 3)Description of Project and Schedule
DTIC
Satellite Networks; Calibrating; Maintenance

20020045516 Boeing Co., Seattle, WA USA
A Search for the Lost IDCSP Constellation
Lambert, J. V.; Sydney, P.; Africano, J. L.; SooHoo, V.; Hamada, K.; Apr. 03, 2001; 20p; In English; Presented at the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. Prepared in collaboration with Boeing Co., Seattle Washington, Lockheed Martin and Ariel Research. The o
Report No.(s): AD-A400583; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

IDCSP Constellation Provides Unique Challenge: a Family of Known US spacecraft; Distinctive Orbital Characteristics; at the Limit of Current Capabilities. Recovery Will Provide Measure of New Sensor Performance.
DTIC
Communication Satellites; Constellations

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20020045359 Pennsylvania State Univ., Dept. of Mechanical and Nuclear Engineering, University Park, PA USA
Design and Study of a LOX/GH2 Throttleable Swirl Injector for Rocket Applications
Greene, Christopher, Pennsylvania State Univ., USA; Woodward, Roger, Pennsylvania State Univ., USA; Pal, Sibtosh, Pennsylvania State Univ., USA; Santoro, Robert, Pennsylvania State Univ., USA; [2002]; 13p; In English; 2002 JANNAF 38th Combustion Subcommittee Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by Department of the Army, USA
Contract(s)/Grant(s): NAG8-1732; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A LOX/GH2 swirl injector was designed for a 10:1 propellant throttling range. to accomplish this, a dual LOX (liquid oxygen) manifold was used feeding a single common vortex chamber of the swirl element. Hot-fire experiments were conducting for rocket chamber pressures from 80 to 800 psia at a mixture ratio of nominally 6.0 using steady flow, single-point-per-firing cases as well as dynamic throttling conditions. Low frequency (mean) and high frequency (fluctuating) pressure transducer data, flow meter measurements, and Raman spectroscopy images for mixing information were obtained. The injector design, experimental setup, low frequency pressure data, and injector performance analysis will be presented. C efficiency was very high (approximately 100%) at the middle of the throttle-able range with somewhat lower performance at the high and low ends. From the analysis of discreet steady state operating conditions, injector pressure drop was slightly higher than predicted with an inviscid analysis, but otherwise agreed well across the design throttling range. Analysis of the dynamic throttling data indicates that the injector may experience transient conditions that effect pressure drop and performance when compared to steady state results.
Author
Liquid Oxygen; Liquid Rocket Propellants; Throttling; Propulsion System Configurations; Fuel Injection; Vortex Injectors

20020045360 Pennsylvania State Univ., Propulsion Engineering Research Center, University Park, PA USA
Turbulent Mixing of Primary and Secondary Flow Streams in a Rocket-Based Combined Cycle Engine
Cramer, J. M., Pennsylvania State Univ., USA; Greene, M. U., Pennsylvania State Univ., USA; Pal, S., Pennsylvania State Univ., USA; Santoro, R. J., Pennsylvania State Univ., USA; [2002]; 21p; In English; JANNAF 38th Combustion Subcommittee Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by NASA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the turbulent mixing of primary and secondary flow streams in a rocket-based combined cycle (RBCC) engine. A significant RBCC ejector mode database has been generated, detailing single and twin thruster configurations and global and local measurements. On-going analysis and correlation efforts include Marshall Space Flight Center computational fluid dynamics modeling and turbulent shear layer analysis. Potential follow-on activities include detailed measurements of air flow static pressure and velocity profiles, investigations into other thruster spacing configurations, performing a fundamental shear layer mixing study, and demonstrating single-shot Raman measurements.
Derived from text
Data Bases; Rocket-Based Combined-Cycle Engines; Turbulent Mixing; Temperature Profiles

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20020045384 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
Chromate Content Bias Versus Overspray Particle Size in Three Aircraft Primer Paints, *Aug. 2000 - Mar. 2002*
Rhodes, Brian S.; Mar. 26, 2002; 90p; In English; Original contains color images
Report No.(s): AD-A400745; AFIT/GEE/ENV/02M-11; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The USA Air Force relies on the corrosion inhibiting properties of chromate-containing primer paints to protect the aluminum skin of its aircraft. Hexavalent chromium (Cr6+) the ingredient responsible for the corrosion inhibiting characteristics of these primers is a known human carcinogen. The concentration of Cr6+ in different particle sizes of paint overspray is important to understand health implications to painters as well as filtration efficiency. Previous research indicates disproportionately less Cr6+

content in smaller particles collected in the overspray of solvent-based epoxy-polyamide paint primers (MIL-P-2377G). This research explores the possibility of a particle size bias in the Cr6+ content of three commonly used aircraft primers: solvent-based epoxy-polyamide, water-based epoxy-polyamide (MIL-PRF-85582C), and solvent-based polyurethane (TT-P-2760A). The mass ratio of air flow to paint flow (A/P ratio) was varied during initial atomization. Seven-stage cascade impactors collected overspray particles into distinct bins with particle size cutoff diameters ranging from 0.7 mm to 34.1 mm. The mass of the dry paint collected in each bin was determined and analyzed for Cr6+ with an Atomic Absorption Spectrometer. In all three primers, smaller particles contained disproportionately less Cr6+ per mass of dry paint than larger particles. Particles with an aerodynamic diameter under 7 mm contained less Cr6+ per mass of dry paint as the particles became smaller. Particles less than 2.6 mm have a mean Cr6+ content of approximately one-third of the expected value. The range of A/P ratios tested in this study had no effect on the Cr6+ content in the overspray.
DTIC
Military Aircraft; Polyurethane Resins; Epoxy Resins

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20020045499 Dayton Univ. Research Inst., OH USA
Polymer Matrix Composite (PMC) Damage Tolerance and Repair Technology *Final Report, 15 Sep. 1999-1 Mar. 2001*
Kim, Ran Y.; Apr. 2001; 27p; In English; Original contains color images
Contract(s)/Grant(s): F33615-95-D-5029; AF Proj. 4347
Report No.(s): AD-A400690; UDR-TR-2001-00041; AFRL-ML-WP-TR-2001-4176; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The application of composites in space structures such as reusable launch vehicles requires a detailed understanding of their mechanical behavior and damage resistance in the service environment. Experimental and analytical studies were conducted on IM7/977-3, a graphite-toughened epoxy, to characterize the influence of cryogenic service temperatures on the strength, modulus, and fracture of this material system, and on transverse crack initiation in cross-ply laminates at 23, -129, and -196 deg C. Transverse tensile and shear strengths and moduli increased at the cryogenic test temperatures while strain to failure decreased, denoting increased brittleness. The stress for the onset of transverse cracking decreased substantially at cryogenic temperatures, due primarily to an increase in the curing residual stresses. Laminated plate theory, in conjunction with maximum stress criteria, appears to overestimate the onset of the transverse cracking in this laminate.
DTIC
Composite Materials; Cryogenic Temperature; Large Space Structures; Modulus of Elasticity; Damage; Tolerances (Mechanics)

20020045510 Aerospace Corp., Lab. Operations, El Segundo, CA USA
Lessons Learned in the Processing of Polycyanurate Resin Composites
Zaldivar, R. J.; Feb. 15, 2002; 27p; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A400774; ATR-98(8565)-8; SMC-TR-02-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Polycyanurate resins are a class of thermosetting polymers that have replaced epoxies as the matrix material of choice for structural composites used in space applications. Composites using a polycyanurate matrix are superior to those with epoxy matrices due to their increased toughness and dimensional stability, lower moisture absorption, reduced outgassing, and higher glass-transition temperatures. However, many of these superior properties are not always achieved due to difficulties that are commonly encountered during processing. This report discusses several cyanate ester monomers and resin blends commercially available, their polymerization behavior, and their properties. In addition, we focus on a number of issues encountered during the processing of these materials and how they were identified and resolved. The most notable problem with this resin system is the inherent sensitivity of the monomer to moisture during processing. This affects the thermal and mechanical behavior of the resin and its resultant composites. In addition, the effects of cure schedule sensitivity are discussed.
DTIC
Epoxy Resins; Matrix Materials; Thermosetting Resins; Polymerization; Esters; Cyanates

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20020044113 Morton Advanced Materials, Woburn, MA USA
CVD Growth and Characterization of Beta-SiC for IR Windows
Goela, Jitendra S.; Jan. 1998; 17p; In English
Report No.(s): AD-A400230; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The status of transparent SiC for short wave (3 5 mm) windows and domes is reviewed. Transparent b-SiC was fabricated by the pyrolysis of methyltrichlorosilane in the presence of excess H2 and argon in a hot wall, chemical vapor deposition reactor. Characterization of the material indicates that the transparent SiC is a theoretically dense, void free, highly pure (99. 9996%) cubic material possessing high optical transmission in the wavelength region 0.5-6 mm, excellent thermal shock resistance and good optical, mechanical, thermal, and electrical properties of interest for windows and domes. Important properties of transparent SiC are compared with those of the other candidate window materials in the 3-5 mm region. Silicon carbide samples of different transparency were characterized to correlate the material transmission with other important material properties. Finally, use of transparent SiC as windows and domes for severe environments is discussed.
DTIC
Fabrication; Infrared Windows; Silicon Carbides; Vapor Deposition; Optical Materials

20020044119 California Univ., Combustion Lab., Irvine, CA USA
Energy Efficient, Ultra Low NOx Industrial Gas Burners Final Report *Final Report*
Jun. 2000; 166p; In English
Report No.(s): PB2002-103142; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

   Reducing pollutant emissions from industrial burners is a prime concern in California, especially in regions that do not meet the National Ambient Air Quality Standards established by the federal government. The southern California air basin is a notorious example of such a 'non-attainment' area for ozone, or 'smog,' and carbon monoxide (CO). Controlling and reducing the pollutant emission of nitrogen oxides (NO-x) is required to reduce ozone while carbon monoxide (CO) reduction is required to ensure energy efficient operation. Unfortunately, the simultaneous reduction of both NO-x and CO in burner systems is often times incongruous and results in poor stability with limited operability. The purpose of this program, sponsored by the California Air Resources Board, the South Coast Air Quality Management District, and the California Institute for Energy Efficiency is to address this challenge of reducing NO-x emissions while maintaining high efficiency for industrial, natural-gas fired burner applications. Three tasks are identified to achieve the program goals: (1) conduct support research and technology development on a model burner, including the advancement of the active control strategy for industrial burners; (2) transfer this information and understanding to industrial-manufactured burners at larger scales, including the measurement of air toxics to ensure that hazardous air pollutants are not increased as a result of low NO-x operation; and (3) provide input to the burner manufacturers for practical applications and demonstrations based on the previous tasks findings.
NTIS
Air Quality; Burners; Exhaust Emission; Nitrogen Oxides; Natural Gas; Combustion

20020044123 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Interface Structure and Surface Polarity in CdTe/ZnTe/(112)Si Hetero-Epitaxial System
Dhar, N. K.; Jan. 1998; 19p; In English
Report No.(s): AD-A400225; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Tellurium adsorption on clean (112) Si surfaces obey a second order kinetic law. The adsorbed Te ad-atoms are highly immobile. Activation energies of adsorption and desorption were measured by isothermal desorption rates. A surface bond energy model was used to calculate the total energy for Te chemisorption on (111) terraces. This model yields a Si-Te bond energy of about 3.46 eV. As-Te bond energy was found to be about 4.0 eV. ZnTe/CdTe epitaxy on As-passivated Si gave uniform and smooth surfaces. As-passivated surfaces always produced B-type CdTe crystallographic polarity. Te coverage on As-passivated surfaces were significantly lower than the coverage observed on clean Si surfaces. A ZnTe nucleation model is proposed suggesting an enhancement in Te surface mobility occurs on As-passivated surfaces. ZnTe nucleation on As-passivated surfaces initiates at the step edges. ZnTe/CdTe epitaxy on Te-terminated Si and directly on clean (112) Si produced rough surface morphology. The surface polarity type depended on the initial Si surface preparation. A B-type polarity is observed for surfaces treated with Te at

temperatures above 500 C. For Te adsorption temperatures below 450 C, CdTe surfaces were A-type and heavily faceted. ZnTe growth on Te-terminated surfaces is suggested to initiate mainly from nucleating on the terraces.
DTIC

Cadmium Tellurides; Crystallography; Epitaxy; Zinc Tellurides; Surface Energy; Morphology

20020044124 Wisconsin Univ., Madison, WI USA

Optimization of J sub c in BSCCO Tapes *Final Report, 1 Jul. 1999-30 Jun. 2000*

Hellstrom, Eric E.; Mar. 27, 2002; 5p; In English

Contract(s)/Grant(s): N00014-99-1-0323

Report No.(s): AD-A400302; No Copyright; Avail: Issuing Activity

   The study was to determine if the microstructure of melt processed Ag-sheathed Bi2SR2CaCu2O(x) (2212) tape could be improved by crystallizing 2212 from its primary phase field. Ag-sheathed tape was fabricated with BSCCO powder whose composition was in the Bi-2212 primary field. It was melt processed. It was learned when analyzing the melt processed tape that the powder that was synthesized was contaminated with Teflon. It had decomposed and reacted with the BSCCO forming SRF2 that shifted the overall BSCCO composition out of the primary phase field. There was not time to synthesize uncontaminated powder in the study. Instead, the effect of the heating rate through the melting point of 2212 was studied. It was found that fully processed tape heated through the melting point at 1 deg C/min had the most homogeneous microstructure. Faster rates led to porosity in the core or ballooning of the Ag-sheath, while slower rates led to large, remnant nonsuperconducting phases in the fully processed tape.
DTIC

Pyrolysis; Microstructure; Contamination; Crystallization; Powder (Particles)

20020044130 Maine Univ., Lab. for Surface Science and Technology, Orono, ME USA

Advanced Development of a Chemical and Biological Sensor Suite *Final Report, 10 Feb. 1999-31 Jul. 2001*

Lad, Robert J.; Mar. 08, 2002; 23p; In English; Original contains color images; --Original contains color plates: All DTIC reproductions will be in black and white. Prepared in cooperation with Sensor Research & Development Corp

Contract(s)/Grant(s): N00178-99-1-9002

Report No.(s): AD-A400447; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   University of Maine researchers working in collaboration with Sensor Research and Development Corp. (SRD) have carried out focused research and engineering development towards an advanced hybrid integrated sensor suite for chemical/biological (CB) point detection. The chemical sensor work emphasized the development of new materials and understanding oxide surface chemistry leading to prototype sensing films with specific functionality and interferent class rejection. The biosensor work involved development of acoustic wave and fluorescence-based devices employing immunological and DNA detection probes.
DTIC

Surface Reactions; Biochemistry; Bioinstrumentation

20020044266 Department of the Navy, Washington, DC USA

Sodium Gallium Oxide Electrolyte Additive for Aluminum Anode Activation

Carreiro, Louis G., Inventor; Tucker, Steven P., Inventor; Nov. 30, 2001; 13p; In English

Patent Info.: Filed 30 Nov. 2001; US-Patent-Appl-SN-10006734

Report No.(s): AD-D020011; No Copyright; Avail: Defense Technical Information Center (DTIC)

   An additive for an aluminum-based semi-fuel cell system includes a combination of components including gallium, oxygen, and a sodium component dissolvable an alkaline electrolyte solution such as seawater and sodium hydroxide. These components form sodium gallium oxide and prevent or reduce formation of an oxide layer on a surface of an aluminum anode in the alkaline electrolyte of the semi-fuel cell system.
DTIC

Aluminum; Electrolytes; Fuel Cells; Sodium; Anodes

20020044824 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Laser Time-of-Flight Mass Spectrometry for Space

Brinckerhoff, W. B., Johns Hopkins Univ., USA; Managadze, G. G., Academy of Sciences (USSR), USSR; McEntire, R. W., Johns Hopkins Univ., USA; Cheng, A. F., Johns Hopkins Univ., USA; Green, W. J., Johns Hopkins Univ., USA; Review of Scientific Instruments; February 2000; ISSN 0034-6748; Volume 7, No. 2, pp. 536-545; In English

Contract(s)/Grant(s): NAG5-4548; Copyright; Avail: Issuing Activity

A miniature reflection time-of-flight mass spectrometer for in situ planetary surface analysis is described. The laser ablation mass spectrometer (LAMS) measures the regolith's elemental and isotopic composition without high-voltage source extraction or sample preparation. The compact size (is less than 2 x 10(exp 3) cubic cm) and low mass (approximately 2 kg) of LAMS, due to its fully coaxial design and two-stage reflectron, fall within the strict resource limitations of landed science missions to solar system bodies. A short-pulse laser focused to a spot with a diameter approximately 30-50 micrometers is used to obtain microscopic surface samples. Assisted by a microimager, LAMS can interactively select and analyze a range of compositional regions (with lateral motion) and with repeated pulses can access unweathered, subsurface materials. The mass resolution is calibrated to distinguish isotopic peaks at unit masses, and detection limits are on resolved to a few ppm. The design and calibration method of a prototype LAMS device is described, which include the development of preliminary relative sensitivity coefficients for major element bulk abundance measurements.
Author (revised)
Mass Spectrometers; Planetary Surfaces; Time of Flight Spectrometers; Design Analysis

20020045144 Brazil Univ., Dept. de Geografia, Brasilia Brazil

Intimate and Macroscopic Mixture Analysis by Linear and Nonlinear Regression. Study Case: Garnerite x Goethite and Garnerite x Asbolan

AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; FerreiradeCarvalho, Ana Paula, Brazil Univ., Brazil; Guimaraes, Renato Fontes, Brazil Univ., Brazil; Meneses, Paulo Roberto, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 51-58; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper evaluates the abundance of minerals estimated from spectral mixtures behavior, both macroscopically and microscopically (intimate). The analyzed mixture comes from a lateritic nickel deposit: pimelite, goethite and Mn laterite (Fazenda Mine, Niquelandia, GO). Mixture simulations were made as in laboratory, from the intimate mixture of the minerals powder followed by the radiometric mensuration, as from mathematical simulation using a linear function to describe the macroscopic mixtures. The calculation of the mineral abundance is estimated by indexes that compare morfometric values of the spectrum of the pure mineral with relationship to the spectrum of the mixture. In order to define the abundance of the mixture models was used the unmixed partial and scale coefficient. The abundance estimate in the intimate and macroscopic mixture can generate errors and should be corrected by mathematics adjustments with experimental data.
Author
Minerals; Simulation; Mixtures; Abundance

20020045146 Brazil Univ., Dept. de Geografia, Brasilia Brazil

Spectral Identification Method (SIM): A New Classifier Based on the ANOVA and Spectral Correlation Mapper (SCM) Methods

AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; FerreiradeCarvalho, Ana Paula, Brazil Univ., Brazil; Meneses, Paulo Roberto, Brazil Univ., Brazil; Guimaraes, Renato Fontes, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 67-72; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Spectral classifiers generate images that express the probability of the material sought according to a similarity parameter. The value of the similarity parameter that attests to the existence of the material varies for each spectral curve sought; this is done manually by the user. This work demonstrates the development of a new spectral classifier called the Spectral Identification Method (SIM). It supplies estimates according to confidence levels of the existence or not of the curve sought. The proposed method is based on two procedures: the algorithm of similarity of the SIM spectral classifier and the analysis of variance (ANOVA) statistical method. This method generates an image of the similarity parameter as much from the SIM as from three relative binary images of the existence of the material according to confidence levels.
Author
Classifiers; Spectrum Analysis; Image Processing; Probability Theory

20020045147 Brazil Univ., Dept. de Geografia, Brasilia Brazil

Employment of the Multiple Endmember Spectral Mixture Analysis (MESMA) Method in Mineral Analysis

AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; Guimaraes, Renato Fontes, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 73-80; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In the analysis of a spectral mixture, the Spectral Mixture Analysis (SMA) method presents many errors because it is hard to adjust the endmembers in the image with the elements really in each pixel. A method proposed to eliminate that source of mistakes is the Multiple Endmember Spectral Mixture Analysis (MESMA), which defines through the root mean square the best association of spectral mixture that describes each pixel. A routine was developed in IDL, which accomplishes that comparison of the models of mixtures defined for each pixel the most appropriate. This method was tested in the Niquelandia (Brazil) mine and showed excellent results being in agreement with the field.
Author
Spectral Mixture Analysis; Image Processing; Remote Sensing; Earth Observations (From Space)

20020045150 NASA Ames Research Center, Moffett Field, CA USA
Spectral Classification of Similar Materials using the Tetracorder Algorithm: The Calcite-Epidote-Chlorite Problem
Dalton, J. Brad, NASA Ames Research Center, USA; Bove, Dana, Geological Survey, USA; Mladinich, Carol, Geological Survey, USA; Clark, Roger, Geological Survey, USA; Rockwell, Barnaby, Geological Survey, USA; Swayze, Gregg, Geological Survey, USA; King, Trude, Geological Survey, USA; Church, Stanley, Geological Survey, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 93-103; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Recent work on automated spectral classification algorithms has sought to distinguish ever-more similar materials. From modest beginnings separating shade, soil, rock and vegetation to ambitious attempts to discriminate mineral types and specific plant species, the trend seems to be toward using increasingly subtle spectral differences to perform the classification. Rule-based expert systems exploiting the underlying physics of spectroscopy such as the US Geological Society Tetracorder system are now taking advantage of the high spectral resolution and dimensionality of current imaging spectrometer designs to discriminate spectrally similar materials. The current paper details recent efforts to discriminate three minerals having absorptions centered at the same wavelength, with encouraging results.
Author
Classifications; Spectrum Analysis; Remote Sensing; Earth Observations (From Space); Minerals

20020045320 Pennsylvania State Univ., University Park, PA USA
Combustion Instabilities in Lean Premixed Combustors *Final Report, 1 Aug. 1998-31 Jul. 2001*
Santavicca, Domenic A., Pennsylvania State Univ., USA; Jul. 2001; 2p; In English
Contract(s)/Grant(s): F49620-98-1-0452; Proj-3484
Report No.(s): AD-A400629; AFRL-SR-BL-TR-02-0740; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This report summarizes the degrees completed and the current status of six students supported by AASERT Grant F49620-98-1-0452.
DTIC
Students; Combustion; Stability

20020045381 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Hexavalent Chromium Dissociation from Overspray Particles into Fluid for Three Aircraft Primers
Schilke, Richard A.; Mar. 26, 2002; 126p; In English; Original contains color images
Report No.(s): AD-A400714; AFIT/GEE/ENV/02M-12; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
DOD and industry use chromate-containing primers extensively to inhibit corrosion on metal assets. Chromate contains Cr(+6), a human carcinogen, but there is little epidemiological evidence of increased lung cancer among spray painters. Using bio-aerosol impingers, overspray particles from three primers (solvent-borne epoxy, water-borne epoxy, and solvent-borne polyurethane) were collected into water to test the hypothesis that the paint matrix inhibits Cr(+6) release into water, under the premise that this simulates Cr(+6) release from particles into lung fluid. Particles were allowed to reside in water for 1 or 24 hours, then separated from the water by centrifugation, and the water tested for Cr(+6). The mean fractions of Cr(+6) released into the water after 1 and 24 hours for each primer (95% confidence) were: 70 plus or minus 5% and 85 plus or minus 5% (solvent epoxy), 74 plus or minus 4% and 84 plus or minus 4% (water epoxy), and 94 plus or minus 3% and 95 plus or minus 2% (polyurethane). Solvent and water epoxy primer 24-hour Cr(+6) release ranged from 100% dissociation to 33% and 48%, respectively. Correlations between Cr(+6) distribution with particle size and % Cr(6+) dissociated from each sample indicate that particles less than 5 mm release a larger fraction of Cr(+6) during the first 24 hours vs. particles greater than 5 micrometers.
DTIC
Chromium Compounds; Primers (Coatings); Polyurethane Resins; Fluids; Aircraft Maintenance

20020045478 Tokyo Univ., Dept. of Mechanical Engineering, Japan

Full Simulation of Silicon Chemical Vapor Deposition Process

Sakiyama, Y.; Takagi, S.; Matsumoto, Y.; Jul. 09, 2000; 9p; In English; See Also ADM001341, Rarefied Gas Dynamics (RGD): 22nd International Symposium held in Sydney, Australia, 9-14 July 2000

Report No.(s): AD-A400630; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Chemical vapor deposition (CVD) process composes a complex system, where chemical reaction and heat and mass transfer interact with each other. and these macro-scale phenomena are deeply related to micro-scale mechanics. Hence multi-scale analysis is required to understand these complicated phenomena and to develop full-scale simulator of the CVD reactor. In this paper, we present the macro-scale simulation by the DSMC method. In those reactors, sometime the important species such as the reactive intermediates have extremely low density ratio. This causes the large statistical fluctuation in the DSMC method, where the number of particles and the calculation time are limited. We propose a new numerical method for this kind of problem and the whole process of silicon CVD is simulated by the new method. We simulate the following CVD process: the gas mixture of silane and hydrogen forms a free expansion jet through a nozzle orifice at the top of the reactor and interact with the heated substrate that is set vertical to flow, where silane decomposes into silylene and silane and silylene deposit onto the surface. It is confirmed that the new method is very effective and make it possible to analyze the CVD process more precisely.

DTIC

Vapor Deposition; Computerized Simulation; Chemical Reactions; Gas Mixtures; Complex Systems

20020045519 Lawrence Livermore National Lab., Livermore, CA USA

A New Kinetic Equation for Dense Gases

Garcia, Alejandro L.; Wagner, Wolfgang; Jul. 2000; 6p; In English; Presented at the Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia, 9-14 July 2000

Contract(s)/Grant(s): W-7405-eng-48; CEC-PSS-1045

Report No.(s): AD-A400847; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Alexander, Garcia and Alder 1 introduced the Consistent Boltzmann Algorithm (CBA) as a simple variant of Direct Simulation Monte Carlo (DSMC) for dense gases. In CBA, collisions alter both the positions and velocities of the particles. In the present work the limiting kinetic equation for CBA is derived; the formulation is similar to the proof that the Boltzmann equation is the limiting kinetic equation for DSMC 11. The relation between this new kinetic equation and the Enskog equation is outlined.

DTIC

Kinetic Theory; Kinetic Equations; Computerized Simulation; Gas Density

20020045533 Cranfield Univ., Royal Military Coll. of Science, Shrivenham, UK

Preliminary Shock Wave Studies in Alumina and Tungsten Carbide *Final Report*

Bourne, N. K.; Millett, J. C.; Dec. 2001; 14p; In English

Contract(s)/Grant(s): N68171-01-M-6222

Report No.(s): AD-A400832; R/D-9240-AN-07; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present report describes the results of shock wave investigations conducted to determine shear strengths of two materials: an alumina (Al203), commercially produced by Coors as AD995, and pressure assisted densified tungsten carbide (WC) manufactured by Cercom. In addition, an effort was made to recover shock compressed AD995 in order to determine the change in the initial microstructure of AD995 due to shock and release wave propagation. The shear strength of these materials was obtained from the measurements of longitudinal and lateral stress under a given compression. Shock Hugoniot of AD995 and WC reported in earlier investigations provided the longitudinal stresses necessary to obtain the values of shear strengths. These when used in conjunction with the lateral stress measured by means of a manganin gage in the current investigation yield the values of shear strength for these materials.

DTIC

Shock Waves; Aluminum Oxides; Tungsten Carbides; Shock Wave Propagation

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20020044110 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Measurement of High Temperature Elastic Moduli of Infrared Transparent Materials
Blodgett, D. W.; Baldwin, K. C.; Spicer, J. B.; Aug. 1998; 9p; In English; Original contains color images
Report No.(s): AD-A400218; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   Insight into a material's high temperature mechanical and microstructural properties can be gained from knowledge of its elastic moduli. For a single-crystal material, the elastic modulus, C(sub ijkl), provides information on the strain (Epsilon sub kl) - stress (sigma sub ij) relationship given by sigma sub ij = C(sub ijkl) dot Epsilon sub kl. This relationship shows that, for a given strain, a large elastic modulus will induce a large stress in the material. In regards to mechanical properties, the crystallographic axis with the largest elastic modulus is the most likely for failure to occur. Before any IR transparent material can be considered for application in a high stress environment, such as IR dome applications, the elastic moduli must be known. Laser-based ultrasonics provides a non-contact, non-destructive means of measuring the elastic moduli of IR transparent materials in an elevated temperature environment. In this paper, the application of laser ultrasonics to IR materials characterization is reviewed. Specific calculations for determining the elastic moduli for isotropic and trigonal crystal symmetries, as exhibited by single-crystal sapphire, are presented. Measurements of the elastic moduli as a function of temperature for borosilicate glass and fused silica, elastically isotropic materials, are presented. In addition, a room-temperature ultrasonic measurement of germanium (Ge), an elastically anisotropic material, is shown.
DTIC
Infrared Radiation; Mechanical Properties; Modulus of Elasticity; Transparence; Refractory Materials

20020045514 Georgia Inst. of Tech., School of Materials Science and Mechanical Engineering, Atlanta, GA USA
Processing of High Conductivity Microchannel Linear Cellular Materials
Cochran, Joe; May 30, 2001; 46p; In English; Original contains color images; See Also ADM001348, Thermal Materials Workshop 2001, held in Cambridge, UK on May 30-June 1, 2001. , The original document contains color images. Contains viewgraphs only. Additional papers can be downloaded from: http://www-mech.eng. cam.ac.uk/onr
Report No.(s): AD-A400618; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Models for paste properties and LCS die designs are nearing completion. Quality of honeycomb extrusion has improved dramatically and defects have been minimized. Metallurgical properties of alloys from direct oxide reduction can approach those of conventionally processed alloys. Due to low pressure drops and thin walls, high efficiency heat exchangers appear feasible for LCAs in a variety of applications. High energy adsorption for LCM in high strength alloys has been demonstrated.
DTIC
Thermal Conductivity; Powder Metallurgy; Heat Exchangers; High Strength Alloys; Adsorption

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20020044107 Romanian Center for Induced Gamma Emission, Bucharest, Romania
Spallation with High Energy Protons as a Source of Hf-178m2 Isomers: Optimization and Accumulation *Final Report, 10 Aug. 2000-10 Aug 2001*
Sep. 07, 2001; 12p; In English
Contract(s)/Grant(s): F61775-00-WE056
Report No.(s): AD-A400215; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   This report results from a contract tasking Induced Gamma Emission Foundation as follows: The contractor will investigate the production of 178m2Hf atoms by means of spallation with high energy protons. The process will be optimized for different

targets such as Re or W to get the best isomer-to-ground state ratio and purity of the samples while maximizing the absolute quantity of produced isomeric material.
DTIC
Isomers; Proton Energy; Spallation; Optimization

20020045487 Army Soldier and Biological Chemical Command, Natick, MA USA
Development of Combat Uniform Fabrics Exhibiting Durable Electrostatic Dissipation Properties *Final Report, Oct. 1990-Feb. 1992*
Winterhalter, C.; Apr. 03, 2002; 21p; In English
Report No.(s): AD-A400723; ASBCC/SSC-NATICK/TR-02/009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    DuPont developed a new electrostatic dissipative fiber called P140. Seven yards of fabric, containing warp and filling bands of various blends of cotton, nylon, and P140, were manufactured to determine the appropriate fiber ratio to achieve the desired electrostatic dissipative performance. These fabrics were tested for electrostatic decay properties initially, after 5, 10, 20, and 30 wash cycles. Most all of the fabrics containing P140 fiber accepted at least the minimum required level of 4000 volts and demonstrated overall decay times of less than 0.5 seconds through 30 wash cycles. One percent P140 was selected as the optimum level for long term durability and protection and was further evaluated in the standard nylon/cotton twill configuration. Three hundred yards of the Temperate Battledress Uniform (BDU) fabric were manufactured with 50 percent cotton, 49 percent nylon, and 1 percent P140. The addition of 1 percent P140 fiber to the nylon and cotton blend fabric resulted in durable electrostatic dissipation through 30 wash cycles and did not detrimentally affect physical, colorfastness, shade or infrared reflectance properties.
DTIC
Fabrics; Electrostatics; Dissipation; Combat; Durability

20020045506 Textron, Inc., Nuclear Metals Div., West Concord, MA USA
Technical Papers on the Eighteen Metallographic Group Meeting
Roman, H. R.; Aug. 1965; 215p; In English; Atomics International, 22-24 Jun. 1964, Canoga Park, CA, USA
Contract(s)/Grant(s): AT(40-1)-2847
Report No.(s): AD-A400733; NMI-5025 PART I; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
    The polishing and etching procedures for preparing metallic, ceramic and cermet specimens of nuclear materials using the Automet polisher are discussed with some typical examples of the excellent results obtained. The attack-polishing method reported by Ambler and Slattery was successfully adapted to automatic polishing allowing more pressure to be applied to the specimen. This modification has eliminated the difficulties normally encountered in the preparation of specimens containing materials of extreme variations in hardness. The advantages of this technique are discussed.
DTIC
Metallography; Metal Polishing

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20020044105 NASA Ames Research Center, Moffett Field, CA USA
Theoretical Studies of Possible Synthetic Routes for the High Energy Density Material Td N4: Excited Electronic States
Lee, Timothy J., NASA Ames Research Center, USA; Dateo, Christopher E., Eloret Corp., USA; [2001]; 13p; In English
Contract(s)/Grant(s): NAS2-99092; RTOP 713-74-29; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Vertical electronic excitation energies for single states have been computed for the high energy density material (HEDM) Td N4 in order to assess possible synthetic routes that originate from excited electronic states of N2 molecules. Several ab initio theoretical approaches have been used, including complete active space self-consistent field (CASSCF), state averaged CASSCF (SA-CASSCF), singles configuration interaction (CIS), CIS with second-order and third-order correlation corrections [CIS(D)) and CIS(3)], and linear response singles and doubles coupled-cluster (LRCCSD), which is the highest level of theory employed. Standard double zeta polarized (DZP) and triple zeta double polarized (TZ2P) one-particle basis sets were used. The CASSCF calculations are found to overestimate the excitation energies, while the SA-CASSCF approach rectifies this error to some extent,

but not completely. The accuracy of the CIS calculations varied depending on the particular state, while the CIS(D), CIS(3), and LRCCSD results are in generally good agreement. Based on the LRCCSD calculations, the lowest six excited singlet states are 9.35(l(sup)T1), 10.01(l(sup)T2), 10.04(1(sup)A2), 10.07(1(sup)E), 10.12(2(sup)T1), and 10.42(2(sup)T2) eV above the ground state, respectively. Comparison of these excited state energies with the energies of possible excited states of N2+N2 fragments, leads us to propose that the most likely synthetic route for Td N4 involving this mechanism arises from combination of two bound quintet states of N2.

Author

Excitation; Nitrogen; Electron States; Configuration Interaction

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20020044131 National Aerospace Lab., Amsterdam, Netherlands

Real-Time Simulation of Impact for the Aerospace Industry

tenDam, A. A.; Kos, J.; Jul. 1999; 16p; In English

Report No.(s): PB2002-103221; NLR-TP-99289; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper a number of issues on impact in mechanical systems are presented. Emphasis is on modeling, simulation and control in a real-time setting for aerospace applications.

NTIS

Aerospace Engineering; Aerospace Industry; Computerized Simulation; Real Time Operation

20020044823 NASA Marshall Space Flight Center, Huntsville, AL USA

X-33 LH2 Tank Failure Investigation Findings

Niedermeyer, Melinda, NASA Marshall Space Flight Center, USA; [2002]; 29p; In English; Manufacturing Problem Prevention Workshop, 26-27 Feb. 2002, El Segundo, CA, USA; Sponsored by Department of the Air Force, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the X-33 LH2 tank failure investigation findings. The conclusions of the investigation include the following: (1) the inner skin microcracked and hydrogen infiltrated; (2) the cracks grew larger under pressure; (3) when pressure was removed, the cracks closed slightly; (4) when the tank was drained and warmed, the cracks closed and blocked the leak path; (5) FOD and debond areas provided an opportunity for a leak path; and (6) there is still hydrogen in the the other three lobes today.

Derived from text

Failure Analysis; Leakage; Microcracks; X-33 Reusable Launch Vehicle

20020045321 Navy Technology Center for Safety and Survivability, Washington, DC, DC USA

Performance Analysis of Foam Agents Required to Combat Liquid Fuel Hazards

Scheffey, J. L., Hughes Associates, Inc., USA; Darwin, R.L., Hughes Associates, Inc., USA; Leach, W., Naval Air Engineering Center, USA; Fallis, S., Naval Air Warfare Center, USA; Williams, Frederick W., Navy Technology Center for Safety and Survivability, USA; Mar. 21, 2002; 20p; In English; Prepared in collaboration with Hughes Associates Inc., Baltimore, MD

Report No.(s): AD-A400628; NRL/MR/6180--02-8608; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a framework for determining the required fire extinguishment and burnback performance of fire fighting foam on Class B fires. A generalized method to assess performance is presented and applied to a Navy aircraft carrier flight deck. For the hazards involved in the flight deck, fire extinguishing agents must control/extinguish fires in 30 to 90 seconds to prevent the onset of critical thresholds (e.g., ordnance cook-off). Current systems utilizing MIL SPEC AFFF meet this requirement. If MIL SPEC AFFF is eliminated, e.g., because of environmental concerns, it will be difficult to meet this performance using available alternative agents/systems. There is a correlation between the MIL SPEC AFFF test method/criteria and large-scale pool fire extinguishment performance; the small-scale MIL SPEC test method provides a factor of safety in terms of extinguishment performance. Any efforts to change the performance characteristics of the MIL SPEC should proceed with extreme caution. The

MIL SPEC tests provide a reasonable screen method for alternative agents. Intermediate scale tests may have to be used for novel agents.
DTIC
Fire Extinguishers; Foams; Reliability Analysis; Firing (Igniting); Fire Fighting

20020045513 California Univ., Mechanical and Aerospace Engineering Dept., Los Angeles, CA USA
Nanoscale Engineering of Heat Transfer and Energy Conversion Processes
Chen, Gang; May 30, 2001; 20p; In English; Original contains color images; See Also ADM001348, Thermal Materials Workshop 2001, held in Cambridge, UK on May 30-June 1, 2001. The original document contains color images. Contains viewgraphs only. Additional papers can be downloaded from: http://www-mech.eng. cam.ac.uk/onr/
Report No.(s): AD-A400627; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   This briefing covered 1) What Can Be Engineered, 2)Phonon and Electron Transport, and 3) Engineering Photon Properties.
DTIC
Heat Transfer; Structural Engineering; Thermoelectricity

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20020045215 Washington State Univ., Pullman, WA USA
Energy Efficient Network Protocols for Wireless and Mobile Networks
Sivalingam, Krishna M., Washington State Univ., USA; Nov. 2001; 9p; In English
Contract(s)/Grant(s): F49620-99-1-0125
Report No.(s): AD-A400626; AFRL-SR-BL-TR-02-0737; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   This research project studies the design, analysis and implementation of energy efficient (also called power aware) network protocols for wireless and mobile networks. Battery power limitations are a very serious concern, and it is essential to study energy efficient protocol design at different layers of the network protocol stack. In particular, we focus on the medium access control, scheduling, quality-of-service reservation signaling, and transport protocols. We completed the design and implementation of signaling mechanism will enable mobiles to inform the base station of the current battery powers levels. The signaling mechanism was based on the 'Integrated Services' (intserv) and 'Differentiated Services' (diffserv) Quality of Service (QOS) architectures. We developed and implemented routing algorithms to accommodate user mobility and integrated them with the signaling mechanism. We completed work on scheduling algorithms for wireless data networks with multiple channels per cell. Adaptive energy efficient scheduling algorithms that dynamically schedule the transmission channel to mobiles based on traffic requests and battery power levels of mobiles were developed and studies. We developed novel error compensation algorithms that enable mobile host to dynamically adapt to channel errors-previous work considered only the base station adapting to channel errors.
DTIC
Wireless Communication; Communication Networks; Design Analysis; Energy Consumption

20020045313 NASA Marshall Space Flight Center, Huntsville, AL USA
Science@NASA: Direct to People!
Koczor, Ronald J., NASA Marshall Space Flight Center, USA; Adams, Mitzi, NASA Marshall Space Flight Center, USA; Gallagher, Dennis, NASA Marshall Space Flight Center, USA; [2002]; 2p; In English; Best Practices for Communicating Science and Technology to the Public, 6-8 Mar. 2002, Gaithersburg, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only
   Science@NASA is a science communication effort sponsored by NASA's Marshall Space Flight Center. It is the result of a four year research project between Marshall, the University of Florida College of Journalism and Communications and the internet communications company, Bishop Web Works. The goals of Science@NASA are to inform, inspire, and involve people in the excitement of NASA science by bringing that science directly to them. We stress not only the reporting of the facts of a particular topic, but also the context and importance of the research. Science@NASA involves several levels of activity from academic communications research to production of content for 6 websites, in an integrated process involving all phases of production. A Science Communications Roundtable Process is in place that includes scientists, managers, writers, editors, and Web technical experts. The close connection between the scientists and the writers/editors assures a high level of scientific

accuracy in the finished products. The websites each have unique characters and are aimed at different audience segments: 1. http://science.nasa.gov. (SNG) Carries stories featuring various aspects of NASA science activity. The site carries 2 or 3 new stories each week in written and audio formats for science-attentive adults. 2. http://liftoff.msfc.nasa.gov. Features stories from SNG that are recast for a high school level audience. J-Track and J-Pass applets for tracking satellites are our most popular product. 3. http://kids. msfc.nasa.gov. This is the Nursemaids site and is aimed at a middle school audience. The NASAKids Club is a new feature at the site. 4. http://www.thursdaysclassroom.com . This site features lesson plans and classroom activities for educators centered around one of the science stories carried on SNG. 5. http://www.spaceweather.com. This site gives the status of solar activity and its interactions with the Earth's ionosphere and magnetosphere.
Author
Internets; NASA Programs; Science; Telecommunication

20020045492 Woods Hole Oceanographic Inst., MA USA
A Compact Coastal Ocean Observing System for Kernel Blitz 2001
Gobat, Jason I.; Weller, Robert A.; Way, Bryan S.; Lord, Jeffrey; Pritchard, Mark; Dec. 2001; 57p; In English; Original contains color images
Contract(s)/Grant(s): N00014-99-1-0090
Report No.(s): AD-A400730; WHOI-2001-18; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

   In this report we describe a compact, easily deployed, moored system for oceanographic and meteorological observations in the coastal ocean. The system consists of a surface and subsurface mooring pair deployed adjacent to one another. Compared to a single catenary surface mooring, this arrangement allows the entire water column to be instrumented. All of the instruments in the system log high resolution time series data. Additionally, the mooring line instruments periodically report averaged data to the buoys via inductive modems. On the subsurface mooring, this averaged data is sent to the surface buoy using an acoustic modem. Inductively coupled mooring line instrumentation includes conductivity, temperature, and pressure sensors, acoustic current meters, and optical backscattering and absorption sensors. In addition to mooring line instruments, the surface buoy collects averaged data from meteorological sensors, including wind speed and direction, barometric pressure, relative humidity, air temperature, precipitation, longwave and shortwave radiation, sea surface temperature and conductivity, and wave height and period. Data from both mooring lines and from the surface meteorological sensors is telemetered to shore via line-of-sight radio and satellite. The entire system, including buoys, moorings, instruments, launch and recovery gear, telemetry receive, and data processing facilities can be packed into a single 20 foot shipping container. The system was successfully deployed to provide environmental monitoring for Kernel Blitz 2001, a U.S. Navy fleet exercise off southern California. Results from the deployment are presented.
DTIC
Kernel Functions; Meteorological Parameters; Oceanography; Data Processing; Telemetry

20020045523 Utah State Univ., Dept. of Electrical and Computer Engineering, Logan, UT USA
Optimal Detection and Signalling in Fast Fading Channels *Final Report, 31 Dec. 1997-31 Dec 1998*
Lo, Chit; Moon, Todd K.; Dec. 1998; 128p; In English
Contract(s)/Grant(s): F49620-98-1-0093
Report No.(s): AD-A400851; AFRL-SR-BL-TR-02-0134; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

   We characterize optimal detection and signaling in terms of signal-to-noise for a fast or frequency-selective channel when the autocorrelation function of the channel is known. Our result characterizes the optimization problem as an eigenvalue/eigenfunction problem with integral operators. For detection, the well-known matched filter and RAKE receivers are limiting cases of our results. In addition, we provide a closed-form expression for the probability density and the cumulative probability function of a quadratic form for zero mean complex gaussian vectors, which is used to evaluate the probability of error of quadratic receivers. Additionally, we provide a procedure that finds pairs of signals or filters for digital communication over a fading channel. With the land-mobile fading channel, the signal/filter pairs obtained with our procedure have a performance significantly better than that of the traditional flat-top pulse and a raised cosine pulse in a PPM pair in terms of the probability of error rate.
DTIC
Multipath Transmission; Fading; Channels (Data Transmission); Signal to Noise Ratios

20020045530 Naval Research Lab., Bay Saint Louis, MS USA

Wavelet Multiscale Edge Detection Using An ADALINE Neural Network to Match Up Edge Indicators

Gendron, Marlin L.; Hammack, James A.; Dec. 14, 2001; 7p; In English

Contract(s)/Grant(s): Proj. PE63207N

Report No.(s): AD-A400838; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   The detection of sudden changes or discontinuities in data is an important issue in digital image processing. Such changes are often referred to as edge information or just edges. Finding edges are essential to many scientific areas ranging from computer vision to target detection. Not only must the detector be able to find the edges, but it must also be able to detect them in the presence of noise. Many edge-detecting algorithms perform well, but many times these algorithms break down in noisy conditions. One possible solution is to take advantage of the multiscale nature of the wavelet transform to detect edges in noisy conditions. This paper explores one possible method of extracting edge information in two-dimensional sidescan acoustic backscatter imagery using a Wavelet Multiscale Edge Detector (WMED). The WMED uses a wavelet transform to generate coefficients and break down a signal into frequency bands at different levels. Scaling a wavelet, or short waveform, with a scale factor and shifting its position produces these levels. Noise present at low levels is smoothed out and disappears at higher levels. The WMED examines and matches up large magnitude high frequency coefficients, called local maxima, over many different levels to detect edges. to enhance the ability of the detector to operate in very noisy conditions, the WMED is modified to use an ADALINE (ADAptive LInear NEuron) neural network that adapts to match up edge indicators across multiple wavelet levels. The ADALINE uses the least mean squared (LMS) learning rule to minimize the mean square error. The LMS algorithm is able to optimize the decision boundaries of the network. This makes the boundaries more effective in the presence of noise. This paper will test the capability of the ADALINE to match up the edge indicators in noisy two-dimensional sidescan imagery.

DTIC

Signal Processing; Wavelet Analysis; Computer Vision

20020045536 National Security Agency, Fort Meade, MD USA

3G Wireless Security: A Government Perspective

Rahikka, Doug, National Security Agency, USA; Sep. 08, 2000; 28p; In English; Original contains color images

Report No.(s): AD-A400573; NSA-TRI23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   A briefing on the government's perspective of wireless security.

DTIC

Telecommunication; Governments

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20020044114 Raytheon Systems Co., Dallas, TX USA

Performance Enhancement in Ferroelectric Thin Films for Uncooled Infrared Imaging Arrays

Udayakumar, K. R.; Beratan, H. R.; Hanson, C. M.; Jul. 1998; 10p; In English; Original contains color images

Report No.(s): AD-A400226; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   The development of high performance monolithic pyroelectric IR detectors requires ferroelectric films of high responsivity and high thermal isolation of self-supporting micromachined structures. In the DARPA-supported IR detector materials program, the ultimate goal is to demonstrate film properties that project to a system-level f/1 NETD of 10 mK for 48.5 micrometers-pixels. This paper will delineate materials and processes engineered towards that objective. Films investigated in this program have been from the PLZT solid solution system. A sub-class of materials within this system, substituted with specific isovalent and donor elements, shows low projected NETDs, the lowest being 13.8 mK for planar wafers. In general, addition of rare earth dopants has the dual effect of lowering the NETD and enhancing dc film resistivity (10 (exp 12)-10(exp 14) Ohms-cm) over 1-10 V. Room temperature film resistivity has been found to increase up to 10(exp 15) Ohms-cm with a film thickness of 960 nm. Processing studies indicate a general correlation among pyrolysis protocols, severity of RTA thermal budget and electrical performance. Furthermore, at film thicknesses of 150-350 nm, properties of films fabricated with a dilute precursor solution project thickness-modified NETDs lower than films with solution of higher molarity. Microstructural examination of rapid thermally

annealed films, through transmission electron microscopy, reveal dense grains 36-43 nm in diameter with no evidence of second phase in the matrix or grain boundaries.
DTIC
Ferroelectricity; Thin Films; Imaging Techniques; Microstructure

20020044126 Cambridge Univ., Dept. of Engineering, Cambridge UK
Thermal Issues in High Current Power Semiconductor Devices
Palmer, P. R.; May 30, 2001; 30p; In English; Thermal Materials Workshop 2001, 30 May - 1 Jun. 2001, Cambridge, UK; Original contains color images; See Also ADM001348. Additional papers can be downloaded from: http://www-mech.eng.cam.ac.uk/onr/. --Original contains color plates: All DTIC reproductions will be in black and white. Contains ciewgraphs only
Report No.(s): AD-A400315; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Partial Contents: (1) Introduction to High Power IGBTs; (2) Issues in IGBT operation; and (3) IGBTs in series.
DTIC
Semiconductor Devices; Thermodynamic Properties; Thyristors; Metal Oxide Semiconductors; Bipolar Transistors

20020044129 Occupational Safety and Health Administration, Washington, DC USA
Ground-Fault Protection on Construction Sites
Jan. 1998; 33p; In English
Report No.(s): AD-A400339; OSHA-3007-Rev; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   With the wide use of portable tools on construction sites, the use of flexible cords often becomes necessary. Hazards are created when cords, cord connectors, receptacles, and cord and plug-connected equipment are improperly used and maintained. Generally, flexible cords are more vulnerable to damage than is fixed wiring. Flexible cords must be connected to devices and to fittings so as to prevent tension at joints and terminal screws. Because a cord is exposed, flexible and unsecured joints and terminals become more vulnerable. Flexible cord conductors are finely stranded for flexibility, but the strands of one conductor may loosen from under terminal screws and touch another conductor, especially if the cord is subjected to stress or strain. A flexible cord may be damaged by activities on the job, by door or window edges, by staples or fastenings, by abrasion from adjacent materials, or simply by aging. If the electrical conductors become exposed, there is a danger of shocks, burns, or fire. A frequent hazard on a construction site is a cord assembly with improperly connected terminals.
DTIC
Cordage; Hazards; Protection; Electric Connectors

20020044219 Dow Corning Corp., Midland, MI USA
ChipSeal Inorganic Sealing Technology for Hermetic-Like Integrated Circuits, Volume 1 *Final Report, 29 Mar. 1994-30 Sep. 1997*
Camilletti, R.; Loboda, M.; McCoy, L.; Sep. 2000; 129p; In English; Original contains color images
Contract(s)/Grant(s): F33615-93-C-1355; AF Proj. 6096
Report No.(s): AD-A400209; AFRL-SN-WP-TR-2001-1013; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
   This report summarizes the application and performance data for inorganic protective coatings to be used for hermetic-like sealing of integrated circuits for use in severe environments with or without secondary packaging.
DTIC
Inorganic Coatings; Hermetic Seals; Integrated Circuits; Protective Coatings; Packaging; Data Bases

20020045323 Sanders Lockheed Martin Co., Nashua, NH USA
Context Switching Reconfigurable Computing *Final Report, Sep. 1996-Jun. 2000*
Scalera, Stephen M.; Aug. 2001; 313p; In English
Contract(s)/Grant(s): F30602-96-C-0350; Proj-E223
Report No.(s): AD-A400675; AFRL-IF-RS-TR-2001-161; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
   This report describes the development of a new field programmable gate array (FPGA) device that enables dynamic reconfiguration, the changing of hardware logic during normal system operation. The Context Switching Reconfigurable (CSRC) FPGA is capable of storing four configurations on-chip and switching between them on a single clock cycle basis. Configurations can be loaded while other contexts are active, and a powerful cross-context data sharing mechanism has bee implemented. This feature allows data to be saved on the device while other programs (context) may operate on the data. This report provides the details of the two-phase development of the CSRC device. The first phase involved the development of a small prototype

integrated circuit (IC) version of the CSRC technology. This IC served both as a concept validation tool and platform for acquiring empirical data about the performance enhancements afforded by this new technology. The subsequent phase entailed the development and fabrication of a large IC (greater capacity) with several additional features. Both the prototype and the larger more capable final device are full custom IC designs designated and fabricated on National Semiconductor's .35u line.
DTIC
Fabrication; Switching; Reconfigurable Hardware; Chips (Electronics)

20020045503 Army Research Lab., Sensors and Electron Devices Directorate, Adelphi, MD USA
Microwave Circuit Simulator for MATLAB
DEL Rosario, Romeo D.; Judy, Daniel C.; Mar. 2002; 16p; In English
Report No.(s): AD-A400740; ARL-TN-184; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   This technical note describes a microwave circuit simulator implemented in the technical computing language, MATLAB. The simulator takes an input circuit with a known admittance matrix, performs a node swap that puts the external nodes (ports) at the upper left hand of an equivalent admittance matrix, then reduces the matrix (regardless of size) to include only the external nodes using Householder's method. The resulting 2 x 2 admittance matrix provides all the information to uniquely define the circuit from its external ports and facilitates straightforward calculation of Z-parameters, S-parameters, etc. (In our case, the reduced matrix is 2 x 2; however, the method applies to multiple port devices as well). Although it can be used by itself, the simulator is designed with a bent toward empirical (circuit based) transistor models and may be incorporated into small and large signal transistor models.
DTIC
Computerized Simulation; Electrical Impedance; Transistors

20020045512 California State Univ., San Diego, CA USA
Optical Receiver Development for High Speed Free-Space Optical Interconnects *Final Report, 1 May 1997-31 Oct. 2000*
Esener, Sadik C., California State Univ., USA; Jun. 2001; 153p; In English
Contract(s)/Grant(s): F49620-97-1-0285; Proj-D107
Report No.(s): AD-A400635; AFRL-SR-BL-TR-02-0131; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
   To this end, we have carried out a comprehensive detailed modeling of electronic post-optical detection amplifiers based on CMOS technology. We have optimized such receivers for FSOI applications. We have validated our models by experimental verification using MOSIS foundry. We have demonstrated the successful operation of CMOS trans-impedance amplifier based receivers fabricated in 0.35 micron process with optimized performance for FSOI links performance.
DTIC
Metal Oxide Semiconductors; Fabrication; Optical Interconnects

20020045518 Princeton Univ., Office of Research and Project Administration, NJ USA
Demonstration of a 100 GBIT/S (GBPS) Scalable Optical Multiprocessor Interconnect System Using Optical Time Division Multiplexing *Final Report, Aug. 1997-Jul. 2001*
Prucnal, Paul R.; Forrest, Stephen R.; Feb. 2002; 26p; In English
Contract(s)/Grant(s): F30602-97-2-0316; DARPA ORDER-B66A; AF Proj. B667
Report No.(s): AD-A400586; AFRL-SN-RS-TR-2002-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Theoretical and an experimental demonstration of an error free 100 Gbit/s optical time division multiplexing (ODM) broadcast star computer interconnect has been performed. A highly scalable novel node design provides rapid inter-channel switching capability on the order of the single channel bit period (1.6 ns). The scalability for optical multichannel networks and interconnects is an important design issue to accommodate an ever growing number of users. It is therefore important that the channel selector at each node should be scalable to a large number of channels. We performed an analysis of a 1024-channel TDM channel selector which can be rapidly reconfigured to access any channel in a high speed OTDM system. We demonstrated that optical TDM technology based on a rapid channel tuner and fast demultiplexer has the potential to enable the construction of high performance, highly scalable and high bandwidth interconnects with crosstalk requirement of -30dB. to unable DWDM-OTDM interfacing between our OTDM interconnect and DWDM Network we proposed and demonstrated an all-optical format converter. This converter is an all-optical interferometric device based on non linear Sagnac loop with a semiconductor optical amplifier (SOA) inside.
DTIC
Time Division Multiplexing; Optical Switching; Multiprocessing (Computers); Optical Equipment

20020045520 Stanford Univ., Edward L. Ginzton Lab. of Physics, Stanford, CA USA

Femtosecond Wavelength Division Multiplexed Interconnect Using Smart Pixel Technology *Final Report, 15 Jul. 1997-14 Jan. 2001*

Miller, David A.; Aug. 2001; 15p; In English

Contract(s)/Grant(s): F49620-97-1-0517; AF Proj. D107

Report No.(s): AD-A400845; AFRL-SR-BL-TR-02-0142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   A short pulse based optical link was demonstrated. It was shown that the short pulse link can remove up to half a bit of skew and jitter from the transmitter. Optoelectronic devices were fabricated and integrated to silicon chips in-house. A first generation wavelength division multiplexed optical link with short pulses was demonstrated and a second generation wavelength division multiplexed optical link system is described. Results are also shown for the testing of individual circuits and devices.

DTIC

Wavelength Division Multiplexing; Multiplexing; Optoelectronic Devices

20020045526 Science Applications International Corp., Albuquerque, NM USA

Evaluation of High-Performance Space Nuclear Electric Generators for Electric Propulsion Application

Woodcock, Gordon, Gray Research, Inc., USA; [2002]; 10p; In English; Space Technology and Applications International Forum (STAIF), 3-7 Feb. 2002, Albuquerque, NM, USA

Contract(s)/Grant(s): GSA-GS-23F-0107J; NASA Order H-32738-D; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   Electric propulsion applications are enhanced by high power-to-mass ratios for their electric power sources. At multi-megawatt levels, we can expect thrust production systems to be less than 5 kg/kWe. Application of nuclear electric propulsion to human Mars missions becomes an attractive alternative to nuclear thermal propulsion if the propulsion system is less than about 10 kg/kWe. Recent references have projected megawatt-plus nuclear electric sources at specific mass values from less than 1 kg/kWe to about 5 kg/kWe. Various assumptions are made regarding power generation cycle (turbogenerator; MHD (magnetohydrodynamics)) and reactor heat source design. The present paper compares heat source and power generation options on the basis of a parametric model that emphasizes heat transfer design and realizable hardware concept. Pressure drop (important!) is included in the power cycle analysis, and MHD and turbogenerator cycles are compared. Results indicate that power source specific mass less than 5 kg/kWe is attainable, even if peak temperatures achievable are limited to 1500 K. Projections of specific mass less than 1 kg/kWe are unrealistic, even at the highest peak temperatures considered.

Author

Electric Propulsion; Nuclear Electric Propulsion; Nuclear Electric Power Generation; Spacecraft Propulsion

20020045540 California Univ., Dept. of Electrical and Computer Engineering, Santa Barbara, CA USA

Multidimensional Multiwavelength Circuit Packet Switching Using Wavelength Conversion via Four Wave Mixing (FWM) in Semiconductor *Final Report, 1 Apr. 1998-31 Mar. 2001*

Blumenthal, Daniel J.; Mar. 31, 2001; 17p; In English

Contract(s)/Grant(s): F49620-98-1-0399; AF Proj. 2305

Report No.(s): AD-A400509; AFRL-SR-BL-TR-02-0145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The focus of this research project is to investigate new approaches to switching multiple wavelengths within small volumes and low power consumption that is independent of data rates. We also have basic experimental results that show a path toward implementation of this type of switching component. The potential impact on future Department of Defense and military needs will be where the movement of large amounts of data is needed in space and power sensitive applications (e.g., fighter aircraft, ship based networks, rapidly deployed networks, harsh environments).

DTIC

Four-Wave Mixing; Packet Switching; Optical Switching; Wavelength Division Multiplexing

20020045544 Florida Univ., Gainesville, FL USA

Development of GaN MOSFETS and MISFETS *Progress Report, 1 Jan.-31 Dec. 2001*

Abernathy, Cammy R.; Mar. 30, 2002; 24p; In English

Contract(s)/Grant(s): N00014-98-1-0204; Proj-01PR00369-00

Report No.(s): AD-A400502; 10-4509-684-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The purpose of this program is to develop GaN power MOSFETs and IGHFETs using novel gate dielectrics. In the past year we have: (1) demonstrated low Dit, 1-4 x 10(exp 11)/eV/sq cm, oxide/GaN interfaces using low temperature deposition of Sc2O3 and MgO; (2) investigated the microstructure of the MgO low T dielectric and determined it to be single crystal at the

semiconductor interface; (3) demonstrated, for the first time, inversion in a GaN device using a gate-controlled diode; and (4) begun development of MgO/AlGaN/GaN IGFETs. As part of the effort to develop power devices, we have also investigated the effect of our low T dielectrics on the passivation of AlGaN/GaN power devices in collaboration with WPAFB. Improvements in power performance up to 3 dB have been obtained using MgO to suppress surface leakage.
DTIC
Dielectrics; Field Effect Transistors; Magnesium Oxides; Semiconductors (Materials)

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20020044122 National Aerospace Lab., Amsterdam, Netherlands
Accuracy, Resolution, and Computational Complexity of a Discontinuous Galerkin Finite Element Methods
vanderVen, H.; vanderVegt, J. J. W.; 2002; 22p; In English
Report No.(s): PB2002-103222; NLR-TP-99304; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   An analysis of the balance between the computational complexity, accuracy, and resolution requirements of a discontinuous Galerkin finite element method for the solution of the compressible Euler equations of gas dynamics is presented. The discontinuous Galerkin finite element method uses a very local discretization, which remains second order accurate on highly non-uniform meshes, but at the cost of an increase in computational complexity and memory use. The question of the balance between computational complexity and accuracy is addressed by studying the evolution of vortices in the wake of a wing. It is demonstrated that the discontinuous Galerkin finite element method on locally refined meshes can result in a significant reduction in computational cost.
NTIS
Finite Element Method; Galerkin Method; Gas Dynamics; Computational Fluid Dynamics

20020044127 Brown Univ., Providence, RI USA
Transport Properties of Biofluids in Micromachined Geometrics *Final Report, Jun. 2000-Sep. 2001*
Breuer, Kenneth; Feb. 2002; 29p; In English
Contract(s)/Grant(s): F30602-00-2-0606; AF Proj. E117
Report No.(s): AD-A400327; AFRL-IF-RS-TR-2002-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The determination of transport properties of biological materials flowing in micron and sub-micron geometrics is discussed. The program goal was to develop techniques to identify anomalous viscous and diffusion effects due to complex biological materials. This goal was met. Experimental techniques were developed to accurately measure mass flows and slop velocities present in polymer materials flowing through sub-micron channels. Measurements were taken and preliminary results were obtained indicating that (as expected) polymeric materials do not conform to expected models. More extensive results were not available due to lack of sufficient time during the current program to complete the original investigation.
DTIC
Micromachining; Transport Properties; Viscous Flow

20020044135 Rensselaer Polytechnic Inst., Dept. of Mechanical Engineering Aeronautical Engineering and Mechanics, Troy, NY USA
Novel Thermal Control Concepts Using Micro Heat Pipes: Spacecraft Thermal Control
Peterson, G. P.; May 30, 2001; 37p; In English; Thermal Materials Workshop 2001, 30 May - 1 Jun. 2001, Cambridge, UK; Original contains color images; See Also ADM001348. Additional papers can be downloaded from: http://www-mech.eng.cam.ac.uk/onr/. --Original contains color plates: All DTIC reproductions will be in black and white. Contains viewgraphs only
Report No.(s): AD-A400322; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Summary and conclusions are as follows: Two new micro heat pipe concepts have been developed; Wire bonded heat pipe arrays with an effective conductivity of 30 times that of solid aluminum have been developed and tested; Flexible polymer heat pipes have been fabricated and modeled; Theses polymer heat pipes offer a greater degree of flexibility and a potentially higher

effective thermal conductivity than any previously developed; Applications of the theses two concepts have a wide range of applications that extends well beyond spacecraft radiators.
DTIC
Heat Pipes; Temperature Control; Spacecraft Environments

20020044745 NASA Langley Research Center, Hampton, VA USA
Piezoelectric Polymers *Final Report*
Harrison, J. S., NASA Langley Research Center, USA; Ounaies, Z., Institute for Computer Applications in Science and Engineering, USA; December 2001; 32p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2001-211422; NAS 1.26:211422; ICASE-2001-43; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The purpose of this review is to detail the current theoretical understanding of the origin of piezoelectric and ferroelectric phenomena in polymers; to present the state-of-the-art in piezoelectric polymers and emerging material systems that exhibit promising properties; and to discuss key characterization methods, fundamental modeling approaches, and applications of piezoelectric polymers. Piezoelectric polymers have been known to exist for more than forty years, but in recent years they have gained notoriety as a valuable class of smart materials.
Author
Characterization; Ferroelectric Materials; Piezoelectricity; Amorphous Materials; Polymers

20020044747 Massachusetts Inst. of Tech., Dept. of Materials Science and Engineering, Cambridge, MA USA
Liquid Crystals Derived from 2-phenyl-isoindoles: Synthesis and Characterization *Final Report*
Jow, Kenny G., Massachusetts Inst. of Tech., USA; Dingemans, Theo J., Institute for Computer Applications in Science and Engineering, USA; December 2001; 18p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2001-211270; NAS 1.26:211270; ICASE-2001-41; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   2-Phenyl-isoindole was investigated as the rigid core unit in a series of asymmetric mesogenic molecules. When the 2-phenyl-isoindole core was terminated with a hexyl tail, no mesophase formation could be observed. When 4-n-(tridecafluorohexyl) was used, however, we observed both monotropic and enantiotropic phase behavior. We found that most functionalities at the anhydride 5-position results in the formation of smectic A (SmA) phases in the temperature range of 70-180 C. Functionalities at the anhydride 4-position suppress mesophase formation. Large substituents (-Br, -NO2) and symmetric substitution patterns (5,6-dichloro, 4,7-dichloro and 4,5,6,7-tetrachloro) on the anhydride moiety increase the melting point and destabilize the mesophase. Temperature dependent X-ray diffraction experiments suggest an interdigitated SmA packing for this family of compounds.
Author
Liquid Crystals; Synthesis (Chemistry); Phenyls; Indoles; Macromolecules

20020044954 NASA Marshall Space Flight Center, Huntsville, AL USA
Steady and Unsteady Simulations of the Flow in an Impeller/Diffuser Stage
Canabal, Francisco, NASA Marshall Space Flight Center, USA; Dorney, Daniel J., NASA Marshall Space Flight Center, USA; Garcia, Roberto, NASA Marshall Space Flight Center, USA; [2002]; 19p; In English; JANNAF Interagency Propulsion Committee Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by NASA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   SLI engine designs will require pumps to throttle over a wide flow range while maintaining high performance. Unsteadiness generated by impeller/diffuser interaction is one of the major factors affecting off-design performance. Initial unsteady simulations are completed for impeller/diffuser stage. The Corsair simulations will continue across a wide flow range and for inducer/impeller/diffuser combinations. Results of unsteady simulations are being used to guide and explore new designs.
Derived from text
Impellers; Computerized Simulation; Unsteady Flow; Computational Fluid Dynamics

20020044955 NASA Marshall Space Flight Center, Huntsville, AL USA
Inducer Hydrodynamic Load Measurement Devices
Skelley, Stephen E., NASA Marshall Space Flight Center, USA; Zoladz, Thomas F., NASA Marshall Space Flight Center, USA;

Marshall Space Flight Center (MSFC) has demonstrated two measurement devices for sensing and resolving the hydrodynamic loads on fluid machinery. The first - a derivative of the six-component wind tunnel balance - senses the forces and moments on the rotating device through a weakened shaft section instrumented with a series of strain gauges. This rotating balance was designed to directly measure the steady and unsteady hydrodynamic loads on an inducer, thereby defining both the amplitude and frequency content associated with operating in various cavitation modes. The second device - a high frequency response pressure transducer surface mounted on a rotating component - was merely an extension of existing technology for application in water. MSFC has recently completed experimental evaluations of both the rotating balance and surface-mount transducers in a water test loop. The measurement bandwidth of the rotating balance was severely limited by the relative flexibility of the device itself, resulting in an unexpectedly low structural bending mode and invalidating the higher-frequency response data. Despite these limitations, measurements confirmed that the integrated loads on the four-bladed inducer respond to both cavitation intensity and cavitation phenomena. Likewise, the surface-mount pressure transducers were subjected to a range of temperatures and flow conditions in a non-rotating environment to record bias shifts and transfer functions between the transducers and a reference device. The pressure transducer static performance was within manufacturer's specifications and dynamic response accurately followed that of the reference.

Author

Cavitation Flow; Pressure Sensors; Hydrodynamics; Dynamic Loads

20020045218 MRJ Technology Solutions, Inc., Moffett Field, CA USA

Improved Boundary Conditions for Cell-centered Difference Schemes

VanderWijngaart, Rob F., MRJ Technology Solutions, Inc., USA; Klopfer, Goetz H., MCAT Inst., USA; Apr. 30, 1997; 16p; In English

Contract(s)/Grant(s): NAS2-14303

Report No.(s): NAS-97-011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cell-centered finite-volume (CCFV) schemes have certain attractive properties for the solution of the equations governing compressible fluid flow. Among others, they provide a natural vehicle for specifying flux conditions at the boundaries of the physical domain. Unfortunately, they lead to slow convergence for numerical programs utilizing them. In this report a method for investigating and improving the convergence of CCFV schemes is presented, which focuses on the effect of the numerical boundary conditions. The key to the method is the computation of the spectral radius of the iteration matrix of the entire demoralized system of equations, not just of the interior point scheme or the boundary conditions.

Author

Boundary Conditions; Compressible Fluids; Fluid Flow

20020045383 Calspan-Buffalo Univ. Research Center, NY USA

Experimental Studies of Shock Interaction Phenomena Associated with Hypersonic Airbreathing Propulsion *Final Report, 1 May 1998-30 Sep. 2001*

Holden, Michael S.; Wadhams, Timothy P.; Smolinski, Gregory J.; Parker, Ronald A.; Harvey, John. K.; Sep. 2001; 80p; In English

Contract(s)/Grant(s): F49620-98-1-0445

Report No.(s): AD-A400749; Rept-3640-1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Experimental studies were conducted in conjunction with computations in a code validation exercise to examine the ability of DSMC and Navier-Stokes techniques to predict the complex characteristics of regions of shock/shock and shock/boundary layer interactions in hypervelocity flows. In the experimental program, detailed heat transfer and pressure measurements in laminar regions of shock wave/boundary layer interaction, and shock/shock interaction, over hollow cylinder/flare and double cone configurations in hypersonic flow. In the best Navier-Stokes solutions the structure and density of the flowfield was captured exactly over both the hollow cylinder/flare and double cone models. The detailed characteristics of the distribution of pressure and heating through the interaction regions were well predicted. In general, for these relatively high-density flows, the DSMC solutions did not capture the characteristics of well-separated flows. In Part 2 of this program, experimental studies have been conducted in the LENS I shock tunnel to investigate the characteristics and performance of full-scale scramjet engines at fully duplicated flight conditions for a range of dynamic pressures at Mach 7. In this program we obtained detailed heat transfer and pressure measurements together with high speed Schlieren and infrared imagery to determine the characteristics of a generic

engine, the flow path of which was configured to be similar to the Air Force Hy-Tech configuration for studies with hydrocarbon and hydrogen fuels.
DTIC
Hypersonic Flow; Shock Layers; Shock Wave Interaction; Boundary Layers; Navier-Stokes Equation

20020045394 NASA Marshall Space Flight Center, Huntsville, AL USA
Recent Improvements in the FDNS CFD Code and its Associated Process
West, Jeff S., NASA Marshall Space Flight Center, USA; Dorney, Suzanne M., NASA Marshall Space Flight Center, USA; [2002]; 18p; In English; JANNAF 38th Combustion Subcommittee Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by NASA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   This viewgraph presentation gives an overview on recent improvements in the Finite Difference Navier Stokes (FDNS) computational fluid dynamics (CFD) code and its associated process. The development of a utility, PreViewer, has essentially eliminated the creeping of simple human error into the FDNS Solution process. Extension of PreViewer to encapsulate the Domain Decompression process has made practical the routine use of parallel processing. The combination of CVS source control and ATS consistency validation significantly increases the efficiency of the CFD process.
Derived from text
Computational Fluid Dynamics; Finite Difference Theory; Parallel Processing (Computers)

20020045482 Academy of Sciences (USSR), Inst. of Thermophysics, Novosibirsk, USSR
Some Features of the Plane Couette Flow
Skovorodko, Petr A.; Jul. 09, 2000; 4p; In English; See Also ADM001341, Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia, 9-14 July 2000. 9-14 Jul 2000
Report No.(s): AD-A400779; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

   In the previous paper it was found, in particular, that in the transition regime of the plane Couette flow the values of total energy flux and shear stress may exceed the corresponding free molecular values. For parameters of the problem (temperature ratio and speed ratio) considered in that paper, the discussed effect was sufficiently small (several percent). The present paper is devoted to more detailed investigation of this effect.
DTIC
Couette Flow; Shear Stress; Temperature Ratio

20020045495 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia
Macroscopic Relations in Rarefied Shear Flows
Erofeev, Alexander I., Tsentralni Aerogidrodinamicheskii Inst., Russia; Friedlander, Oscar G., Tsentralni Aerogidrodinamicheskii Inst., Russia; Jul. 09, 2000; 6p; In English; See Also ADM001341, Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia, 9-14 July 2000., 9-14 Jul 2000
Contract(s)/Grant(s): 99-01-00154; 00-15-96069
Report No.(s): AD-A400695; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   The plane Couette flow and hypersonic flow past a flat plate at a zero angle of attack are investigated. The relations between stresses and heat fluxes in the Couette flows and the gradients of velocity and temperature are derived. These relations are the generalization of Newton-Fourier (Navier-Stokes) relations for the shear flow with strong nonequilibrium. The relation between longitudinal heat flux, on the one hand, and both transverse heat flux and shear stress with another, is detected. The possibility of application of the relations, derived for Couette flow, to hypersonic flow past flat plate at zero angle of attack is investigated. The limits of applicability of Burnett relations for this flow are determined
DTIC
Shear Flow; Rarefied Gas Dynamics; Shear Stress; Couette Flow

20020045505 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA
Relationships Between Turbulent Wall Pressure and Velocity Field Sources
Chang, Peter A., III; Dec. 09, 1998; 144p; In English; Original contains color images
Contract(s)/Grant(s): AF Proj. ILIR
Report No.(s): AD-A400734; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

   Although the study of wall pressure fluctuations (WPFs)has a long and venerable history, relatively little is known about the nature of the source terms responsible for the wall pressure. This study takes advantage of the three-dimensional velocity fields available from turbulence simulations to try to answer some long-standing questions about the nature of WPFs. Which parts of

the boundary layer generate the various wave number regions of the wall pressure? What are the dominant source terms? What are the relative magnitudes of the mean-shear (MS) and turbulence-turbulence (TT)wall pressures? What physical processes in the boundary layer generate the wall pressure?
DTIC
Turbulent Boundary Layer; Pressure Oscillations; Turbulence; Velocity Distribution

20020045522 Tokyo Denki Univ., Japan
A Compressible Turbulent Flow in a Molecular Kinetic Gas Model
Sakurai, Akira; Takayama, Fumio; Jul. 09, 2000; 4p; In English; Original contains color images; Presented at the Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, (Australia) 9-14 July 2000. The original document contains color images
Report No.(s): AD-A400856; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
   This is the continuation of the effort to utilize a kinetic molecular model approach to the problem of turbulence oriented computation of compressible flow. The Boltzmann equation is employed in its integral form with the BGK model of the collision term. This time, we compute a periodic compressible flow inside a unit cube from a random velocity field having an energy spectrum of isotropic type, uniform density and temperature. Results show the development of many small shock waves like structures along with vortex or eddy shocklets scattered in the entire flow field. While the energy spectrum does not change much in its pattern with time, as should be the case, some quantities like density distribution changes quickly to a turbulent state from its initial uniform one. Some geometric properties of computed flow field are derived from its velocity deformation tensor.
DTIC
Turbulent Flow; Molecular Structure; Compressible Flow

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20020044109 Coleman Research Corp., Huntsville, AL USA
Signal Processing Environment For Analysis and Reduction (SPEAR)
Smith, Brian C.; Kinashi, Yasuhiro; Jan. 1998; 15p; In English; Original contains color images
Report No.(s): AD-A400220; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   A need for a high-fidelity sensor design simulation model to accurately predict the envelope of the system performance and to offset the escalating cost of the system development and testing are widely accepted by the defense community. This paper presents one such example of the modeling capability developed for the Ballistic Missile Defense (BMD) application, called the Signal Processing Environment for Analysis and Reduction (SPEAR) simulation. SPEAR has become a key IR sensor design and signal processing performance verification tool for the BMD Advanced Sensor Technology Program (ASTP), the Discriminating Interceptor Technology Program (DITP), and the Ground Based Interceptor (GBI) and , where it is used for sensitivity analyses, algorithm evaluations, and performance assessments. For these programs, SPEAR provides an algorithm testing simulation to evaluate candidate signal processing options, and implement and test performance of algorithms proposed through advanced technology programs. In addition, SPEAR is used to process real world data to provide assessments of sensor performance and provide preflight predictions. The simulation has been interfaced to the Synthetic Scene Generation Model (SSGM), a community standard background and target scene generation simulation. Through this interface sensor performance can be evaluated against realistically modeled backgrounds to evaluate filtering, detection, and false alarm performance. SPEAR is a hi-fidelity passive infrared (IR) sensor and signal processing simulation for staring, scanning, and hybrid sensors. It allows the user to specify the IR sensor physics including the sensor, optics, focal plane array or scan chip assembly, analog signal processor, time dependent and object dependent processing parameters and specific noise sources such as optics, jitter, fixed pattern noise, dark current, and gamma spike noise.
DTIC
Signal Processing; Data Reduction; Design Analysis; Computerized Simulation; Antimissile Defense; Sensors

Exploring a Black Body Source as an Absolute Radiometric Calibration Standard and Comparison with a NIST Traced Lamp Standard

Green, Robert O., Jet Propulsion Lab., California Inst. of Tech., USA; Chrien, Thomas, Jet Propulsion Lab., California Inst. of Tech., USA; Sarture, Chuck, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 193-203; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Radiometric calibration of the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) is required for the scientific research and application objectives pursued with the spectroscopic measurements. Specifically calibration is required for: inter-comparison of AVIRIS data measured at different locations and at different times; analysis of AVIRIS data with data measured by other instruments; and analysis of AVIRIS data in conjunction with computer models. The primary effect of radiometric calibration is conversion of AVIRIS instrument response values (digitized numbers, or DN) to units of absolute radiance. For example, a figure shows the instrument response spectrum measured by AVIRIS over a portion of Rogers Dry Lake, California, and another figure shows the same spectrum calibrated to radiance. Only the calibrated spectrum may be quantitatively analyzed for science research and application objectives. Since the initial development of the AVIRIS instrument-radiometric calibration has been based upon a 1000-W irradiance lamp with a calibration traced to the National Institute of Standards and Technology (NIST). There are several advantages to this irradiance-lamp calibration approach. First, the considerable effort of NIST backs up the calibration. Second, by changing the distance to the lamp, the output can closely span the radiance levels measured by AVIRIS. Third, this type of standard is widely used. Fourth, these calibrated lamps are comparatively inexpensive. Conversely, there are several disadvantages to this approach as well. First, the lamp is not a primary standard. Second, the lamp output characteristics may change in an unknown manner through time. Third, it is difficult to assess, constrain, or improve the calibration uncertainty delivered with the lamp. In an attempt to explore the effect and potentially address some of these disadvantages a set of analyses and measurements comparing an irradiance lamp with a black-body source have been completed. This research is ongoing, and the current set of measurements, analyses, and results are presented in this paper.
Author
Calibrating; Imaging Spectrometers; Infrared Spectrometers; Luminaires

AVIRIS Inflight Calibration Experiments, Analysis, and Results in 2000

Green, Robert O., Jet Propulsion Lab., California Inst. of Tech., USA; Pavri, Betina, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 205-218; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) measures spectra from 370 to 2500 nm with nominally 10-nm sampling and resolution. The spectra are acquired as images with an 11 km width and up to 800 km length from the ER-2 platform or 2.1 km width and 160 km length from the Twin Otter platform. AVIRIS measurements are used for a range of Earth science research and application objectives. The molecular absorption and particle scattering properties expressed in the calibrated AVIRIS measurements are used. For both science research and application objectives, calibration of the AVIRIS spectra is required to produce useful results. Each year prior to the flight season AVIRIS is calibrated in the laboratory. However, the temperature, pressure, vibration, and observational geometry, as well as mechanical, electrical, and operational interfaces of the laboratory are different than the environment on board the airborne platform. to validate the calibration of AVIRIS in the flight environment, an inflight calibration experiment is orchestrated at the beginning of each flight season. In most years additional inflight calibration experiments occur towards the middle and end of the flight season as well. For an inflight calibration experiment, AVIRIS acquires airborne data over a designated calibration target. In concert with the airborne data acquisition, surface and atmospheric properties at the calibration target are measured in situ. These in situ measurements are used to constrain a radiative transfer code and predict the radiance incident at the AVIRIS instrument from the calibration target. This prediction is compared with the AVIRIS-measured radiance to validate the calibration of AVIRIS in the flight environment. Additional properties (such as the AVIRIS inflight measurement precision) are determined as well. This paper presents measurements, analyses, and results from the inflight calibration experiment held on the dry lake bed surface of Rogers Dry Lake, California, on June 5, 2000.
Author
Calibrating; Imaging Spectrometers; Infrared Spectrometers; In Situ Measurement; Radiance; Earth Observations (From Space)

20020045186 NASA Stennis Space Center, Bay Saint Louis, MS USA

An Approach to Application of Multispectral Sensors, using AVIRIS Data

Warner, Amanda, Lockheed Martin Space Operations, USA; Blonski, Slawomir, Lockheed Martin Space Operations, USA; Gasser, Gerald, Lockheed Martin Space Operations, USA; Ryan, Robert, Lockheed Martin Space Operations, USA; Zanoni, Vicki, NASA Stennis Space Center, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 445-453; In English; Also announced as 20020045138; Original contains color illustrations

Contract(s)/Grant(s): NAS13-650; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

High spatial resolution multispectral/hyperspectral sensors are being developed by private industry with science/research customers as end users. With an increasingly wide range of sensor choices, it is important for the remote sensing science community and commercial community alike to understand the trade-offs between ground sample distance (GSD), spectral resolution, and signal-to-noise ratio (SNR) in selecting a sensor that will best meet their needs. High spatial resolution hyperspectral imagery and super resolution multispectral charge-coupled device imagery can be used to develop prototypes of proposed data acquisition systems without building new systems or collecting large sets of additional data. by using these datasets to emulate proposed and existing systems, imaging systems may be optimized to meet customer needs in a virtual environment. This approach also enables one to determine, a priori, whether an existing dataset will be useful for a given application.
Derived from text

Data Acquisition; Imaging Techniques; Remote Sensing; Earth Observations (From Space); Signal to Noise Ratios

20020045343 NASA Goddard Space Flight Center, Greenbelt, MD USA

The LIULIN-3M Radiometer for Measuring Particle Doses in Space and on Aircraft

Stassinopoulos, E. G., NASA Goddard Space Flight Center, USA; Stauffer, C. A., Stinger Gaffarian Technologies, USA; Dachev, T. P., Bulgarian Academy of Sciences, Bulgaria; Tomov, B. T., Bulgarian Academy of Sciences, Bulgaria; Dimitrov, P. G., Bulgarian Academy of Sciences, Bulgaria; Brucker, G. J., Radiation Effects Consultants, USA; February 2002; 18p; In English; Fifth European Conference on Radiation and Its Effects on Components and Systems, 13-17 Sep. 1999, Fontevraud, France

Report No.(s): NASA/TM-2002-210003; Rept-2002-01124-0; NAS 1.15:210003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper reports on the development of a compact radiation monitor/dosimeter, the LIULIN-3M, and on extended measurements conducted on the ground and on commercial aircraft on domestic and international flights.
Author

Dosimeters; Radiometers; Product Development

20020045497 Michigan Univ., Dept. of Mechanical Engineering, Ann Arbor, MI USA

Solid State High Authority Telescoping Actuators *Final Report, Jul. 1997-Jun. 2001*

Brei, Diann E., Michigan Univ., USA; Hallovan, John, Michigan Univ., USA; Apr. 11, 2002; 108p; In English; Original contains color images

Contract(s)/Grant(s): N00014-97-1-0009

Report No.(s): AD-A400693; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Stacks are one of the most commonly used form of piezoelectric actuation; unfortunately, they provide small displacements and as the stroke requirement grows so does the length of the stack. For many applications with small volume sizes, stacks are not viable due to their packaging size and if too long can pose a buckling risk. Fortunately, while many of these applications require more stroke, typically factor of 2 to 15 more than a stack, the force requirement is typically less than that generated by a stack, leaving room for amplification techniques. While there are several external techniques, they experience severe losses% leading to a great reduction in work efficiency. The goal of this research effort was to develop a family of high authority actuators ranging in size from the submillimeter scale, for embedment in composite structures, to discrete actuators up to the centimeter scale, that could provide modest stroke amplification (2 to 15 times) in a compact package with minimal force reduction. A solid state, monolithic piezoelectric actuation architecture was developed that internally leverages the piezoelectric strain by a series of cascading shells uniquely connected by end caps such that the shells "telescope" out when activated. The tailorability of the displacement output of this actuator design permits much more efficient coupling of the actuator output into a loading profile of similar impedance and thereby much greater effective actuator output. This research consisted of the four specific tasks: 1) Manufacturing development and process modeling, 2) Actuator performance modeling, 3) Experimental component testing and 4) Performance analysis and evaluation. In this report, the methodologies employed and the results obtained are summarized for each of these tasks, for more detailed development the reader is referred to the papers in Appendix B.
DTIC

Actuators; Solid State; Piezoelectricity; Composite Structures

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20020044112 Academy of Sciences (USSR), General Physics Inst., Moscow, USSR
GaSe Parametric Oscillator Pumped by Powerful Holmium Laser Near 3 Microns *Final Report*
May 31, 2001; 29p; In English; Original contains color images
Contract(s)/Grant(s): F61775-99-WE
Report No.(s): AD-A400216; SPC-99-4041; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   This report results from a contract tasking General Physics Institute as follows: The contractor will develop a gallium-selenide optical parametric oscillator pumped by a holmium laser near 3 microns with a goal of achieving an output energy from the OPO near the degenerate wavelength of 10 to 20mJ per pulse.
DTIC
Gallium Selenides; Oscillators; Holmium; Parametric Amplifiers; Tunable Lasers

20020045325 Naval Research Lab., Washington, DC USA
Contribution of Bound States to the Harmonic Generation in Hydrogen at Moderate Laser Intensities
Davis, Jack; Blaha, Milan; Mar. 22, 2002; 23p; In English
Report No.(s): AD-A400700; NRL/MR/6720--02-8601; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Zero-field parabolic states of hydrogen are used as a basis set for the study of low-order harmonic generation in moderately strong laser fields. The disappearance of bound parabolic states with large electric dipole moments in moderately strong fields leads to the simplification of the expression for the total time-dependent dipole moment of the atom. by including only contributions from bound atomic states and with some simplifying assumptions, it is possible to express the total dipole moment by an analytic formula. The present results are compared to the benchmark calculations.
DTIC
Harmonic Generations; Hydrogen; Laser Outputs; Atomic Energy Levels

20020045361 NASA Ames Research Center, Moffett Field, CA USA
A Hydrodynamic Theory for Spatially Inhomogeneous Semiconductor Lasers, 2, Numerical Results
Li, Jianzhong, NASA Ames Research Center, USA; Ning, C. Z., NASA Ames Research Center, USA; [2001]; 14p; In English
Contract(s)/Grant(s): RTOP 704-40-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   We present numerical results of the diffusion coefficients (DCs) in the coupled diffusion model derived in the preceding paper for a semiconductor quantum well. These include self and mutual DCs in the general two-component case, as well as density- and temperature-related DCs under the single-component approximation. The results are analyzed from the viewpoint of free Fermi gas theory with many-body effects incorporated. We discuss in detail the dependence of these DCs on densities and temperatures in order to identify different roles played by the free carrier contributions including carrier statistics and carrier-LO phonon scattering, and many-body corrections including bandgap renormalization and electron-hole (e-h) scattering. In the general two-component case, it is found that the self- and mutual- diffusion coefficients are determined mainly by the free carrier contributions, but with significant many-body corrections near the critical density. Carrier-LO phonon scattering is dominant at low density, but e-h scattering becomes important in determining their density dependence above the critical electron density. In the single-component case, it is found that many-body effects suppress the density coefficients but enhance the temperature coefficients. The modification is of the order of 10% and reaches a maximum of over 20% for the density coefficients. Overall, temperature elevation enhances the diffusive capability or DCs of carriers linearly, and such an enhancement grows with density. Finally, the complete dataset of various DCs as functions of carrier densities and temperatures provides necessary ingredients for future applications of the model to various spatially inhomogeneous optoelectronic devices.
Author
Diffusion Coefficient; Quantum Wells; Semiconductors (Materials); Semiconductor Lasers

20020045393 NASA Ames Research Center, Moffett Field, CA USA
A Hydrodynamic Theory for Spatially Inhomogeneous Semiconductor Lasers: Microscopic Approach
Li, Jianzhong, NASA Ames Research Center, USA; Ning, C. Z., NASA Ames Research Center, USA; [2001]; 19p; In English
Contract(s)/Grant(s): RTOP 704-40-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Starting from the microscopic semiconductor Bloch equations (SBEs) including the Boltzmann transport terms in the distribution function equations for electrons and holes, we derived a closed set of diffusion equations for carrier densities and temperatures with self-consistent coupling to Maxwell's equation and to an effective optical polarization equation. The coherent many-body effects are included within the screened Hartree-Fock approximation, while scatterings are treated within the second Born approximation including both the in- and out-scatterings. Microscopic expressions for electron-hole (e-h) and carrier-LO (c-LO) phonon scatterings are directly used to derive the momentum and energy relaxation rates. These rates expressed as functions of temperatures and densities lead to microscopic expressions for self- and mutual-diffusion coefficients in the coupled density-temperature diffusion equations. Approximations for reducing the general two-component description of the electron-hole plasma (EHP) to a single-component one are discussed. In particular, we show that a special single-component reduction is possible when e-h scattering dominates over c-LO phonon scattering. The ambipolar diffusion approximation is also discussed and we show that the ambipolar diffusion coefficients are independent of e-h scattering, even though the diffusion coefficients of individual components depend sensitively on the e-h scattering rates. Our discussions lead to new perspectives into the roles played in the single-component reduction by the electron-hole correlation in momentum space induced by scatterings and the electron-hole correlation in real space via internal static electrical field. Finally, the theory is completed by coupling the diffusion equations to the lattice temperature equation and to the effective optical polarization which in turn couples to the laser field.
Author
Diffusion Coefficient; Distribution Functions; Holes (Electron Deficiencies); Nuclear Scattering; Semiconductor Plasmas

20020045546 Air Force Research Lab., Wright-Patterson AFB, OH USA
Extended Mid-Infrared (IR) Tuning of a Cr2+:CdSe Lasers
Schepler, Kenneth L.; McKay, Jason B.; Roh, Won B.; Oct. 2001; 6p; In English
Contract(s)/Grant(s): AF Proj. 2301
Report No.(s): AD-A400505; AFRL-SN-WP-TP-2002-100; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   We report 2450-3400 nm laser operation from a Cr2+:CdSe laser, pumped by a Q-switched Tm,Ho:YLF laser. Laser tuning was achieved over a large part of the 2100-3400 nm emission cross section bandwidth using a simple grating-tuned resonator.
DTIC
Q Switched Lasers; Tunable Lasers

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20020044952 Toledo Univ., Dept. of Mechanical, Industrial and Manufacturing Engineering, OH USA
Investigation of Dynamic Force/Vibration Transmission Characteristics of Four-Square Type Gear Durability Test Machines *Final Report, 1 Aug. 2001 - 31 Mar. 2002*
Kahraman, Ahmet, Toledo Univ., USA; May 2002; 78p; In English
Contract(s)/Grant(s): NAG3-2641; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
   In this study, design requirements for a dynamically viable, four-square type gear test machine are investigated. Variations of four-square type gear test machines have been in use for durability and dynamics testing of both parallel- and cross-axis gear set. The basic layout of these machines is illustrated. The test rig is formed by two gear pairs, of the same reduction ratio, a test gear pair and a reaction gear pair, connected to each other through shafts of certain torsional flexibility to form an efficient, closed-loop system. A desired level of constant torque is input to the circuit through mechanical (a split coupling with a torque arm) or hydraulic (a hydraulic actuator) means. The system is then driven at any desired speed by a small DC motor. The main task in hand is the isolation of the test gear pair from the reaction gear pair under dynamic conditions. Any disturbances originated at the reaction gear mesh might potentially travel to the test gearbox, altering the dynamic loading conditions of the test gear mesh, and hence, influencing the outcome of the durability or dynamics test. Therefore, a proper design of connecting structures becomes a major priority. Also, equally important is the issue of how close the operating speed of the machine is to the resonant frequencies of the gear meshes. This study focuses on a detailed analysis of the current NASA Glenn Research Center gear pitting test machine for evaluation of its resonance and vibration isolation characteristics. A number of these machines as the one illustrated has been used over last 30 years to establish an extensive database regarding the influence of the gear materials, processes surface treatments

and lubricants on gear durability. This study is intended to guide an optimum design of next generation test machines for the most desirable dynamic characteristics.

Derived from text

Durability; Dynamic Characteristics; Vibration Measurement; Gears; Vibration Isolators; Computerized Simulation

20020044953 NASA Marshall Space Flight Center, Huntsville, AL USA

The CORSAIR Turbomachinery Code: Status and Plans

Dorney, Daniel J., NASA Marshall Space Flight Center, USA; Sondak, Douglas L., Boston Univ., USA; [2002]; 31p; In English; 2002 JANNAF Joint Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by NASA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the CORSAIR turbomachinery code's status and plans. Details are provided on the CORSAIR algorithms, full- and partial-admission turbine simulations, the Simplex turbine, instantaneous Mach number, unsteady pressure admission graphs, variable fluid property RLV-133 simulations, instantaneous entropy function, pumps and inducers, and future plans.

CASI

Algorithms; Pumps; Computerized Simulation; Turbines

20020045477 Naval Surface Warfare Center, Bethesda, MD USA

Investigation of Submerged Arc Welding with Improved MIL-100S Wires (LC-100)

Franke, G. L., Naval Surface Warfare Center, USA; Jun. 2001; 39p; In English; Original contains color images

Report No.(s): AD-A400647; NSWCCD-61-TR-2001/02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Navy is conducting a program to develop and certify an improved MIL-100S wire for welding HSLA and HY steels. The goal of the effort is to produce a welding wire with better hydrogen cracking resistance than the current MIL-100S wire, enabling HSLA-80 and HSLA-100 steels to be fabricated without preheat (60 deg F minimum) for plate thicknesses up to two inches. A Navy, industry, and academic development effort produced and evaluated a number of experimental low-carbon welding consumables. Gas metal arc weldments produced with these wires demonstrated increased hydrogen cracking resistance compared to current MIL-100S wires, while maintaining acceptable weld metal strength and toughness over a wide range of weld metal cooling rate conditions. In the present study, limited submerged arc welding characterization of these wires was conducted to determine if any flux or wire modifications would be required to permit their use in submerged arc welding applications. Weldments were produced with one commercial flux and the three 0.045-inch-diameter experimental wires, as well as 0.045-inch-diameter and 0.093-inch-diameter sizes of one current heat of MIL-100S wire. Three other commercial fluxes were used to produce additional weldments with the 0.093-inch-diameter MIL-100S wire. All weldments were produced in one-inch-thick HSLA-100 steel at a calculated cooling rate of approximately 350 F/s. Weld metal properties were tested to determine adequacy of the experimental wires for submerged arc welding, for comparison to current MIL-100S wires in SAW, and performance variations due to wire size and flux composition variations. The results indicated that the experimental wires exhibited acceptable strength and toughness, wire size scale up should not adversely affect properties, and use of other commercial fluxes with these wires should not generally be a problem. Based on these results no modifications to the wire or the fluxes were deemed necessary.

DTIC

Arc Welding; Wire; Steels; Fabrication

20020045528 Air Force Research Lab., Turbine Engine Div., Wright-Patterson AFB, OH USA

High-Temperature Tribology of Silicon Nitride Lubricated with Cesium-Based Inorganic Films *Final Report, 30 Jan. 1997-30 Sep. 2001*

Rosado, Lewis; Dec. 2001; 174p; In English

Contract(s)/Grant(s): AF Proj. 3048

Report No.(s): AD-A400831; AFRL-PR-WP-TR-2001-2110; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The sliding friction and wear of silicon nitride was investigated in 600 deg C air using a ball-on-disk configuration. Two cesium-based inorganic films were studied as potential high-temperature solid lubricants for limited-life turbine engine bearing applications: a sodium silicate bonded Cs_2WOS_3 coating and a cesium silicate chemical reaction film. Wear surfaces were characterized using various analytical techniques. The best tribological performance was obtained with thin chemical reaction films annealed in sulfur-rich air. Friction coefficients (f) and wear factors as low as 0.04 and 4 x 10(exp -9) cu mm/N.m respectively, were obtained at 600 deg C with this system. These are comparable to boundary liquid lubricating films at much

lower temperatures. The data provide conclusive evidence that neither tungsten nor molybdenum is necessary for low friction at 600 deg C. The results also suggest that sulfur and cesium play important roles in the formation of a lubricious silicate film by chemically reacting with the silicon dioxide scale that naturally forms on silicon nitride surfaces. This occurs via a complex hot-corrosion mechanism involving the inward diffusion of oxygen from the surrounding air and cesium from the coatings and the outward diffusion of nitrogen and magnesium from the silicon nitride substrate. It is believed that sulfur provides a reaction path for the hot-corrosion mechanism.
DTIC
Cesium; Tribology; Silicon Nitrides; Inorganic Compounds

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20020044121 Iowa State Univ. of Science and Technology, Center for Aviation Systems Reliability, Ames, IA USA
Study of the Factors Affecting the Sensitivity of Liquid Penetrant Inspections: Review of Literature Published form 1970 to 1998 *Final Report*
Larson, B.; Jan. 2002; 70p; In English
Contract(s)/Grant(s): FAA-97-C-001.Amendments-7
Report No.(s): PB2002-103128; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
   This report summarizes the factors that can have an effect on the sensitivity of a liquid penetrant inspection (LPI). The intent of this task was to identify and organize the body of work that has led to current LPI practices. The effort involved reviewing nearly 350 abstracts and more than 100 full articles and reports that were published between 1970 and 1998. In general, only reports in the public domain have been included. An effort was made to include only information that discussed accepted scientific principles, presented test data, or introduced strong arguments supporting theories and observations concerning the effectiveness of penetrant inspection systems. The report attempts to briefly summarize the main points of the published literature and to direct the reader to the references where they can obtain additional information. Over 40 factors have been identified that can affect the performance of a penetrant inspection. These factors include variables affected by: (1) the formulation of the materials; (2) the inspection methods and techniques; (3) the process control procedures; (4) human factors; and (5) the sample and flaw characteristics. This information will be used by the Federal Aviation Administration to help guide future research efforts regarding LPI procedures.
NTIS
Inspection; Penetrants; Defects; Sampling

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20020045317 California Univ., Mechanical and Aerospace Engineering Dept., Los Angeles, CA USA
Development of MLPG and LBIE Methods for Nonlinear Problems of Fracture *Final Report, 15 Mar. - 14 Dec. 2000*
Atluri, Satya N., California Univ., USA; [2002]; 23p; In English
Contract(s)/Grant(s): NAG1-2274; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The truly meshless local Petrov-Galerkin (MLPG) method holds a great promise in solving boundary value problems, using a local symmetric weak form as a natural approach. In the present paper, in the context of MLPG and the meshless interpolation of a moving least squares (MLS) type, a method which uses primary and secondary nodes in the domain and on the global boundary is introduced, in order to improve the accuracy of solution. The secondary nodes can be placed at any location where one needs to obtain a better resolution. The sub-domains for the shape functions in the MLS approximation are defined only from the primary nodes, and the secondary nodes use the same sub-domains. The shape functions based on the MLS approximation, in an integration domain, have a single type of a rational function, which reduces the difficulty of numerical integration to evaluate the weak form. The present method is very useful in an adaptive calculation, because the secondary nodes can be easily added and/or moved

without an additional mesh. The essential boundary conditions can be imposed exactly, and non-convex boundaries can be treated without special techniques. Several numerical examples are presented to illustrate the performance of the present method.
Author
Boundary Value Problems; Galerkin Method; Least Squares Method; Computerized Simulation

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20020044100 Bureau of Reclamation, Flood Hydrology Group, Denver, CO USA
Flood Hazard Analysis, Folsom Dam Central Valley Project, California
Jan. 2002; 232p; In English
Report No.(s): PB2002-103147; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
   The primary objective of this study is to develop an estimate of peak discharge frequency of the American River at Folsom Dam in the annual probability range (for dam safety). The primary concern is floods with annual probabilities generally in the range greater than 0.001 to 0.00001 (1 in 1,000 to 1 in 10,000). This peak discharge frequency information is combined with historical hydrographs to develop probabilistic hydrographs based on paleoflood information.
NTIS
Dams; Probability Theory; Floods; Hydrography

20020044538 Geological Survey, Water Resources Div., Helena, MT USA
Streamflow and Water Quality of the Lower Tenmile Creek Watershed, Lewis and Clark County, West-Central Montana, 1997 and 1998 *Final Report*
Parrett, C.; Kendy, E.; Aug. 2001; 48p; In English
Report No.(s): PB2002-103054; USGS-WRI-01-4120; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   A reconnaissance investigation of streamflow and water quality in the lower Tenmile Creek watershed near Helena, Montana, was conducted by the U.S. Geological Survey in cooperation with Lewis and Clark County and the Montana Department of Natural Resources and Conservation, in 1997 and 1998. Streamflow data were collected at one year-round and three seasonal streamflow-gaging stations, and at two periodic measurement sites. Three sets of synoptic streamflow measurements were made at 21 sites. Streamflow varies from site to site in the study area as a result of complex patterns of runoff, ground-water and surface-water interaction, and diversion management. Flow increases were attributed mostly to tributary inflow, and flow losses largely were attributed to irrigation diversions. Synoptic measurements verified the general pattern of flow gains and losses shown by the streamflow-gaging station records.
NTIS
Water Quality; Montana; Water Pollution; Laminar Flow

20020044545 Geological Survey, Water Resources Div., Mounds View, MN USA
Water-Quality Assessment of Part of the Upper Mississippi River Basin, Minnesota and Wisconsin: Trace Elements in Streambed Sediment and Fish Livers, 1995-96. National Water-Quality Assessment Program
Kroening, S. E.; Fallon, J. D.; Lee, K. E.; 2002; 40p; In English
Report No.(s): PB2002-101576; USGS/WRI-00-4031; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Trace elements were analyzed in streambed sediment and fish livers in part of the Upper Mississippi River Basin as part of the U.S. Geological Survey's National Water-Quality Assessment Program. The purpose of this report was to describe the occurrence and distribution of trace elements, describe the relations of concentrations measured to natural and anthropogenic factors, and describe any relation between concentrations in streambed sediment and fish livers. The study unit included the part of the Upper Mississippi River Basin from the river's source in northern Minnesota to the outlet of Lake Pepin, a natural lake on the river located near Red Wing, Minnesota. Streambed sediment samples were collected from 27 sites located throughout the study unit, and fish were obtained from 25 sites.
NTIS
Water Quality; Trace Elements; Sediments; Mississippi River (US); River Basins

Geological Survey, Water Resources Div., Baltimore, MD USA

Simulation of Ground-Water Flow and Transport of Chlorinated Hydrocarbons at Graces Quarters, Aberdeen Proving Ground, Maryland

Tenbus, F. J.; Fleck, W. B.; 2001; 66p; In English; Prepared in cooperation with Army Garrison, Fort Belvoir, VA

Report No.(s): PB2002-101577; USGS/WRI-01-4106; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

   Military activity at Graces Quarters, a former open-air chemical-agent facility at Aberdeen Proving Ground, Maryland, has resulted in ground-water contamination by chlorinated hydrocarbons. As part of a ground-water remediation feasibility study, a three-dimensional model was constructed to simulate transport of four chlorinated hydrocarbons (1,1,2,2-tetrachloroethane, trichloroethene, carbon tetrachloride, and chloroform) that are components of a contaminant plume in the surficial and middle aquifers underlying the east-central part of Graces Quarters. The model was calibrated to steady-state hydraulic head at 58 observation wells and to the concentration of 1,1,2,2-tetrachloroethane in 58 observation wells and 101 direct-push probe samples from the mid-1990s. Simulations using the same basic model with minor adjustments were then run for each of the other plume constituents.

NTIS

Ground Water; Water Flow; Simulation; Carbon Tetrachloride; Three Dimensional Models

20020045138 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Proceedings of the Tenth JPL Airborne Earth Science Workshop

Green, Robert O., Editor, Jet Propulsion Lab., California Inst. of Tech., USA; December 2001; 474p; In English; Tenth JPL Airborne Earth Science Workshop, 27 Feb. - 2 Mar. 2001, Pasadena, CA, USA; Also announced as 20020045139 through 20020045188; Original contains color illustrations

Report No.(s): JPL-Publ-02-1; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

   This publication contains the proceedings of the AVIRIS Earth Science and Applications Workshop - a forum held to report science research and applications results with spectral images measured by the NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS). These papers were presented at the Jet Propulsion Laboratory on February 27 and 28 and March 1 and 2, 2001.

Author

Airborne Equipment; Conferences; Earth Sciences; Imaging Spectrometers; Infrared Imagery; Infrared Spectrometers; Earth Observations (From Space); Remote Sensing

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20020045139 Spectral Sciences, Inc., Burlington, MA USA

Shadow-Insensitive Material Detection/Classification with Atmospherically Corrected Hyperspectral Imagery

Adler-Golden, Steven M., Spectral Sciences, Inc., USA; Levine, Robert Y., Spectral Sciences, Inc., USA; Matthew, Michael W., Spectral Sciences, Inc., USA; Richtsmeier, Steven C., Spectral Sciences, Inc., USA; Bernstein, Lawrence S., Spectral Sciences, Inc., USA; Gruninger, John, Spectral Sciences, Inc., USA; Felde, Gerald, Air Force Research Lab., USA; Hoke, Michael, Air Force Research Lab., USA; Anderson, Gail, Air Force Research Lab., USA; Ratkowski, Anthony, Air Force Research Lab., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 3-12; In English; Also announced as 20020045138; Original contains color illustrations

Contract(s)/Grant(s): F19628-99-C-0031; F19628-00-C-0022; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

   Hyperspectral imaging (HSI) from airborne or space-based platforms, currently conducted mainly in the 0.4 - 2.5 micrometer wavelength region, is a valuable technique for detection and classification of materials and objects on the Earth's surface. In a typical analysis, the spectral radiance data are 'corrected' or compensated for the atmospheric and illumination conditions to yield spectral reflectance, and the results are processed with any of a variety of algorithms, which may, for example, compare the contents of each pixel with reference spectra for classification, search the scene for a desired material spectrum, or calculate a terrain property such as a vegetation cover index. Atmospheric correction algorithms include several based on first-principles radiation transport models as well as the Empirical Line Method (ELM), which utilizes known materials in the scene. An alternative approach is to work with the original radiance data; this is effective for identifying scene anomalies and for supervised

processing, where the scene elements can be identified visually by an analyst. Regardless of the analysis' method, varying illumination of the ground caused by shadowing or uneven terrain poses problems for detection and classification. The radiance spectra can vary in both shape and amplitude, since the ground-reflected light is altered while the atmospherically scattered components, consisting of backscattering and forward-scattered surface-reflected light ('adjacency' scattering), remain unchanged. In this paper we present and compare some simple, new algorithms for classification and whole-pixel material detection using atmospherically corrected data. These include the SAM, an extension of the SAM that accounts for the different spectral shapes of sunlight and skylight, and algorithms that use a Euclidean distance rather than a spectral angle difference metric. The most effective algorithm in this study computes the distance between the pixel spectrum and a best-fit combination of direct-sun-illuminated and sky-illuminated apparent reflectance spectra of the desired material or endmember. Another, simpler algorithm computes an analogous distance using the SAM's assumption of an invariant spectral shape.

Derived from text

Algorithms; Classifications; Imaging Techniques; Atmospheric Correction; Earth Observations (From Space)

20020045140 Saga Univ., Dept. of Information Science, Japan

Results from the Vicarious Calibration of ADEOS/AVNIR and the Visible and Near-Infrared Channels of OCTS with AVIRIS

Arai, Kohei, Saga Univ., Japan; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 13-20; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A field campaign for the vicarious calibration of the instruments ADEOS/AVNIR (Advanced Earth Observing Satellite/Advanced Visible and Near-Infrared Radiometer) and the visible to near-infrared channels of the Ocean Color and Temperature Scanner (OCTS) was conducted based on the reflectance-based method. The results show a not so small difference between the estimated top of atmosphere (ToA) radiance and the instruments' data-derived radiance, i.e., 3.5 to 20%. In order to confirm the validity of the difference, vicarious calibration based on the radiance-based method was conducted using Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data. Also, an effect due to the spectral refractive index of aerosol on the estimation of the ToA radiance was confirmed, together with smear-like image defect in the AVNIR imagery data.

Author

Calibrating; Infrared Imagery; Radiance; Upper Atmosphere

20020045141 Carnegie Institution of Washington, Stanford, CA USA

Spectral Unmixing of Vegetation, Soil and Dry Carbon in Arid Regions: Comparing Multispectral and Hyperspectral Observations

Asner, Gregory P., Carnegie Institution of Washington, USA; Heidebrecht, Kathleen B., Carnegie Institution of Washington, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 21-34; In English; Also announced as 20020045138

Contract(s)/Grant(s): NCC5-480; NAG5-8709; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Remote sensing of vegetation cover and condition is critically needed to understand the impacts of land use and climate variability in and and semi-arid regions. However, remote sensing of vegetation change in these environments is difficult for several reasons. First, individual plant canopies are typically small and do not reach the spatial scale of typical LANDSAT-like satellite image pixels. Second, the phenological status and subsequent dry carbon (or non-photosynthetic) fraction of plant canopies varies dramatically in both space and time throughout and and semi-arid regions. Detection of only the 'green' part of the vegetation using a metric such as the normalized difference vegetation index (NDVI) thus yields limited information on the presence and condition of plants in these ecosystems. Monitoring of both photosynthetic vegetation (PV) and non-photosynthetic vegetation (NPV) is needed to understand a range of ecosystem characteristics including vegetation presence, cover and abundance, physiological and biogeochemical functioning, drought severity, fire fuel load, disturbance events and recovery from disturbance.

Derived from text

Satellite Imagery; Vegetation; Remote Sensing; Arid Lands

20020045142 New Jersey Inst. of Tech., Newark, NJ USA

Application of Radiative Transfer Theory to Atmospheric Correction of AVIRIS Data

Bagheri, Sima, New Jersey Inst. of Tech., USA; Stamnes, Knut, Stevens Inst. of Tech., USA; Li, Wei, Stevens Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 35-40; In English; Also announced as 20020045138

Contract(s)/Grant(s): NSF 98-06982; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The aim of an algorithm based on Radiative Transfer Theory (RTT) is a physical-bio-optical description of the radiative transfer process in the entire system from the solar source to the remote sensor via the hydrosols. The quantitative description provides a sound basis for the inversion of remotely sensed signals to retrieve the optical water quality parameters. Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) records the integrated effects of the solar source, the atmosphere and the targeted surface. to compensate for the atmospheric effects in the AVIRIS data, an air water interface atmospheric correction algorithm based on DISORT was applied to infer the water-leaving radiance. The spectral absorption and backscattering defined as the inherent optical properties (IOP) are physically related to subsurface irradiance reflectance R(0-). The subsurface irradiance reflectance links the optical properties to the water signals recorded by AVIRIS. This paper reports on the application of physically-based algorithms for retrieval of optical properties of the coastal waters for which the near-infrared black pixel approximation is invalid. to test the retrieval algorithm the configuration of the AVIRIS bands are used. In conjunction with bio-optical models these optical properties are used to characterize such waters in terms of chlorophyll concentration, colored dissolved organic matter and inorganic material.

Derived from text

Algorithms; Atmospheric Correction; Optical Properties; Radiative Transfer; Satellite Imagery

20020045143 Uniao Pioneira de Integracao Social, Dept. de Geografia, Brasilia, Brazil

RCGb Index: A Tool for Mapping the Degree of Weathering in the Tropical Soils in Brazil

MacedodeMelloBaptista, Gustavo, Uniao Pioneira de Integracao Social, Brazil; daSilvaMadeiraNetto, Jose, Centro de Pesquisas Agropecuaria dos Cerrados, Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 41-50; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In the Cerrado region the presence of classes of soils that possess perceptible mineralogical variations is common. Those classes cannot be separated with the methods adopted in the usual soil surveys. The mineralogical variation of the soils is studied by means of the analysis of samples collected in the field. For mapping, the extrapolation of the punctual values used morphologic approaches of correlation with the topography, with the origin material, etc. The discrimination of the soils with various contents of kaolinite and gibbsite is not reliable for field approaches. Though the variability of these two minerals can be assayed, a systematic sampling with high density of points would be necessary. This procedure would increase the cost of the projects. That limitation has led to a search for new techniques and resources to increase the understanding of the pedologic covering. Recent progress in the acquisition of images of remote sensing has been introduced as an alternative to the usual method. Now the studies related to the remote sensing change the actual paradigm, with the appearance of the hyperspectral systems sensor. The main difference between those two types of sensor systems is in the spectral resolution. The hyperspectral sensor now in operation is AVIRIS (Airborne Visible/Infrared Imaging Spectrometer), property of the Jet Propulsion Laboratory (JPL/NASA). It is an airborne system composed of four spectrometers that give images continually scan the reflected optical spectrum from 0.4 to 2.5 micrometers, in 224 bands, with widths of 10 nm approximately.

Derived from text

Kaolinite; Mineralogy; Soils; Satellite Imagery; Variability; Spectrum Analysis

20020045145 Brazil Univ., Dept. de Geografia, Brazilia Brazil

Analysis Absorption Band Positioning: A New Method for Hyperspectral Image Treatment

AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; FerreiradeCarvalho, Ana Paula, Instituto Nacional de Colonizacaoe Reforma Agraria, Brazil; Meneses, Paulo Roberto, Brazil Univ., Brazil; Guimaraes, Renato Fontes, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 59-65; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This work demonstrates a new program for the spectral classification of hyperspectral images based on the positioning of the absorption band. The program generates an image where the value of the pixel is the wavelength of the absorption band after the continuum removal. This program, when used with similar spectral features, provides a classification with better results than the usual procedures (i.e., Spectral Angle Mapper, Spectral Correlation Mapper, Spectral Feature Fitting, correlation coefficient R used by Tricorder). This program was tested in Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) hyperspectral images obtaining excellent results as much in mineralogical as vegetation discrimination.

Author

Absorption Spectra; Classifications; Infrared Imagery; Spectrum Analysis; Image Processing

20020045148 Utah Univ., Dept. of Geography, Salt Lake City, UT USA

Investigation of Imaging Spectroscopy for Discriminating Urban Land Covers and Surface Materials

Chen, Jeremy, Utah Univ., USA; Hepner, George F., Utah Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 81-83; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Urban growth has been recognized by many globe change agendas as not only a regional phenomenon but also a continental, global scale phenomenon. Many urban areas face environmental degradation, such as loss of open space, natural vegetation, agricultural lands, wetlands, and natural habitat at an increasing rate. The development of urban information systems, which contain baseline information and the urban growth models, is crucial for predicting regional patterns of urbanization. The implementation of the urban systems requires a variety of digital data sources, such as land covers and surface materials, as well as a temporal database. Although urban analysis is one of the most common applications of remote sensing, the information derived from remotely sensed data is often insufficient for operational use. One of the main problems is that the spectral and spatial resolutions of sensors are too coarse to identify the desired information for urban analysis. The urban landscape is extremely heterogeneous with a variety of land cover types and surface materials mixing together within a small area. If many materials are located within one sensor pixel, each material will contribute its unique spectral characteristic to the mixed pixel and make the pixel spectrally impure. In addition, many urban materials, such as soils and impervious surfaces, yield similar spectral signatures. Therefore, broadband data, such as LANDSAT, and pixel-based analysis, such as maximum likelihood classification, are inadequate for discriminating urban land covers and surface materials. Hyperspectral data such as the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), which covers spectral range from 400 to 2500 nm and has 224 continuous channels with 10-nm bandwidth, is capable of discriminating most of the terrestrial materials including urban surface materials. Imaging spectroscopy has been successfully applied to geological, aquatic, ecological and atmospheric research. Surprisingly, it has been used sparsely for the study of urban areas. The objective of this study is to investigate the feasibility of using the field spectra as the reference to identify the urban land covers and surface materials in the low-altitude AVIRIS scene.

Author

Cities; Imaging Techniques; Infrared Imagery; Land Use; Remote Sensing; Earth Observations (From Space)

20020045149 Instituto de Estudos Avancados, Sao Jose dos Campos, Brazil

Atmospheric Influence on NDVI Determinations from Variable Red and Near Infrared AVIRIS Band Positioning

daCostaMoreira, Romero, Instituto de Estudos Avancados, Brazil; Galvao, Lenio Soares, Instituto Nacional de Pesquisas Espacias, Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 85-91; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Spectral vegetation indices are combinations of spectral values obtained from two or more remote sensor bands, generally the red (R) and the near infrared (NIR) spectral regions. The determination of these indices is important not only for the monitoring of the vegetation at a global scale, but also to allow the prediction of some vegetation parameters. A vegetation index frequently used in global vegetation studies is the Normalized Difference Vegetation Index (NDVI) that relates spectral data according to the equation NDVI = (rho(sub NIR) - rho(sub R))/(rho(sub NIR) + rho(sub R)), where rho(sub NIR) is the reflectance value in the NIR band and rho(sub R) is the reflectance value in the R band. The objective of this work is to discuss the basic problem of NDVI variations considering the atmospheric effects and the band positioning and bandwidth influences. For this purpose, the position and width of narrow and broad R and NIR bands, including those from some multispectral sensors, were simulated from AVIRIS (Airborne Visible/Infrared Image Spectrometer) data collected in central Brazil, and NDVI values were calculated and compared from apparent and surface reflectance images.

Derived from text

Infrared Imagery; Near Infrared Radiation; Normalized Difference Vegetation Index; Remote Sensors; Vegetation

20020045151 Agricultural Research Service, Hydrology and Remote Sensing Lab., Beltsville, MD USA

Assessing the Spatial Distribution of Plant Litter

Daughtry, C. S. T., Agricultural Research Service, USA; Hunt, E. R., Jr., Agricultural Research Service, USA; Walthall, C. L., Agricultural Research Service, USA; Gish, T. J., Agricultural Research Service, USA; Liang, Shun-Lin, Maryland Univ., USA; Kramer, E. J., Agricultural Research Service, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 105-114; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Quantifying crop residue cover on the soil surface is important for improving estimates of surface energy balance, net primary productivity, nutrient cycling, and carbon sequestration. Quantifying crop residue cover is also an important factor in controlling soil erosion and evaluating the effectiveness of conservation tillage practices. by reducing the movement of eroded soil into streams and rivers, the movement of nutrients and pesticides is reduced. The overall result is less soil erosion and improved water quality. Current methods for quantifying crop residue cover are tedious and somewhat subjective. The standard technique for measuring crop residue cover used by the USDA Natural Resources Conservation Service (NRCS) is visual estimation along a

line-transect. Reviews of crop residue measurement techniques document recent modifications and illustrate the unresolved problems of current techniques. Rapid, accurate, and objective methods to quantify residue cover are needed. The objectives of this research were to: (1) determine the spectral reflectance of green plants, plant litters, and soils as a function of water content; (2) assess the limits of discrimination that can be expected; and (3) evaluate hyperspectral imaging data for providing information on the spatial distribution of plant litter. This research provides the scientific foundation required for sensor development and field testing.

Derived from text

Farm Crops; Imaging Techniques; Residues; Soils; Spatial Distribution; Earth Observations (From Space); Vegetation

20020045152 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Calibration and Vegetation Field Spectra Collection for the 2000 AVIRIS Hawaii Deployment

Dennison, Philip E., California Univ., USA; Gardner, Margaret E., California Univ., USA; Roberts, Dar A., California Univ., USA; Green, Robert O., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 115-118; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

As part of the April 2000 Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) Hawaii deployment, two researchers from the University of California, Santa Barbara, were sent to Hawaii to collect supporting field data. The primary goal of the fieldwork was to obtain spectra of bright targets to be used for retrieving surface reflectance from AVIRIS imagery. Secondary goals included recording the spectra of dominant vegetation, marking the position of homogeneous land cover for use as potential image endmembers (PIEs), and recording firsthand impressions of cover types. Primary and secondary goals were met. Spectra were recorded for 12 calibration targets on 5 islands and spectra were obtained for 61 vegetation species. Twenty PIEs were located, and video was used to document cover at 56 locations.

Author

Infrared Imagery; Spectral Reflectance; Vegetation; Spectrum Analysis; Calibrating; Remote Sensing

20020045153 NASA Stennis Space Center, Bay Saint Louis, MS USA

Nutrient Stress Detection in Corn, Using Neural Networks and AVIRIS Hyperspectral Imagery

Estep, Lee, Lockheed Martin Space Operations, USA; Davis, Bruce, NASA Stennis Space Center, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 119-123; In English; Also announced as 20020045138

Contract(s)/Grant(s): NAS13-650; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The US Department of Agriculture (USDA) Agricultural Research Service (ARS) Variable Rate (VRAT) Nitrogen Application site in Shelton, Nebraska, represents a well-documented, corn-growing quarter section. The USDA VRAT site is used to systematically study nutrient stress in corn by varying sub-plot application of fertilizer. The field has four replicates of five blocks that vary by nitrogen treatment from 0-kg/ha to 200-kg/ha in 50-kg/ha increments. The treatment blocks are set out in a randomized, complete block design. Typically, the VRAT is planted in a ridge till, monoculture corn and is watered by a central pivot irrigation system on a three-day period. Since water stress can increase spectral reflectance from corn leaves, it is important that the N-application plots be adequately watered so that only nutrient-related stress will predominate. A figure shows imagery of the USDA VRAT site with the fertilizer amounts for each block shown. Low-altitude Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) hyperspectral imagery was acquired over the Shelton, Nebraska, VRAT site on July 22, 1999. The overflight produced 3-meter pixels with 224 spectral bands. Ground personnel supported the mission with measurements at the time of the overflight. The image data was pre-processed at JPL before being sent out to an investigator. The data arrived radiometrically corrected, allowing ready application of an atmospheric correction procedure. The Atmosphere Removal Program (ATREM) was used to perform an atmospheric correction. The AVIRIS imagery after ATREM correction was output as relative reflectance. This relative reflectance file was scaled by an empirical line procedure to provide reflectances that matched closely those measured in the field.

Author

Agriculture; Corn; Infrared Imagery; Spectral Reflectance; Remote Sensing; Earth Observations (From Space)

20020045155 Brazil Univ., Dept. de Ecologia, Brasilia Brazil

Measurement of Color in Hyperspectral Images (AVIRIS) using the CIE (Commission International D'Eclairage) System

FerreiradeCarvalho, Ana Paula, Brazil Univ., Brazil; AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; Guimaraes, Renato Fontes, Brazil Univ., Brazil; daSilvaMadeiraNetto, Jose, Centro de Pesquisas Agropecuaria dos Cerrados, Brazil; MariadaCunhaBustamante, Mercedes, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 133-139; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A new concept in the digital processing of images is appearing due to the spectroscopy image. The AVIRIS sensor (Airborne Visible/Infrared Imaging Spectrometer) developed by NASA in 1983 was the first imaging system capable of continually acquiring bands. This sensor captures along the portion of the reflected solar spectrum from 0.4 micrometers to 2.5 micrometers. The system was developed to obtain data that could be used in the several areas of geosciences. AVIRIS became operational in 1988 after some fittings and corrections accomplished by researchers at JPL (the Jet Propulsion Laboratory), NASA. AVIRIS was brought to Brazil in 1995 for the SCAR-B (Smoke, Clouds and Radiation Brazil), mission with the purpose of evaluating atmospheric effects. This activity was accomplished by NASA, INPE (National Institute of Space Researches) and AEB (Brazilian Space Agency). Hyperspectral remote sensing is a recent technology that has been growing fast and provides a constant proliferation of new methods and algorithms for analysis. In those images, the large quantity of information allows for a wide propagation of methods in order to improve the detection and quantification of the materials that compose the scene. During the SCAR-B mission, the AVIRIS sensor over-flew the Niquelandia area on August 16, 1995, generating images of areas with supergenic mineral concentration (nickel lateritic). This high concentration of nickel has marked effects on the distribution of vegetation types. The flight line was accomplished longitudinally to the Niquelandia complex, crossing the geological units. The aim of this work was to adapt and test the employment of the CIE color system in AVIRIS hyperspectral images to differentiate vegetation patterns. The employment of the color concept provides a reduction of the spectral space, concentrating the information, and it allows for better interactivity with the analyst because of the visual approach.

Author

Color; Imaging Techniques; Infrared Imagery; Remote Sensing; Vegetation; Earth Observations (From Space)

20020045157 California Univ., Geography Dept., Santa Barbara, CA USA

Road Extraction from AVIRIS Using Spectral Mixture and Q-Tree Filter Techniques

Gardner, Margaret E., California Univ., USA; Roberts, Dar A., California Univ., USA; Funk, Chris, California Univ., USA; Noronha, Val, California Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 145-150; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Accurate road location and condition information are of primary importance in road infrastructure management. Additionally, spatially accurate and up-to-date road networks are essential in ambulance and rescue dispatch in emergency situations. However, accurate road infrastructure databases do not exist for vast areas, particularly in areas with rapid expansion. Currently, the US Department of Transportation (USDOT) extends great effort in field Global Positioning System (GPS) mapping and condition assessment to meet these informational needs. This methodology, though effective, is both time-consuming and costly, because every road within a DOT's jurisdiction must be field-visited to obtain accurate information. Therefore, the USDOT is interested in identifying new technologies that could help meet road infrastructure informational needs more effectively. Remote sensing provides one means by which large areas may be mapped with a high standard of accuracy and is a technology with great potential in infrastructure mapping. The goal of our research is to develop accurate road extraction techniques using high spatial resolution, fine spectral resolution imagery. Additionally, our research will explore the use of hyperspectral data in assessing road quality. Finally, this research aims to define the spatial and spectral requirements for remote sensing data to be used successfully for road feature extraction and road quality mapping. Our findings will facilitate the USDOT in assessing remote sensing as a new resource in infrastructure studies.

Author

Pattern Recognition; Remote Sensing; Roads; Earth Observations (From Space)

20020045164 Dartmouth Coll., Dept. of Earth Sciences, Hanover, NH USA

Oleoresin, Chemistry and Spectral Reflectance in "Stressed" Lodgepole and White Bark Pine, Mammoth Mountain, California

Hickey, James C., Dartmouth Coll., USA; Birnie, Richard W., Dartmouth Coll., USA; Zhao, Mei-Xun, Dartmouth Coll., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 219-228; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Development of methods to identify the physical and chemical character of materials on the earth's surface is one of the foci of hyperspectral remote sensing activities. Enhancing the ability to elucidate changes in foliar chemistry that relate to the health of a plant is a benefit to plant physiologists, foresters, and plant ecologists, as well as geologist and environmental scientists. Vegetation covers the landscape throughout the temperate and tropical regions of the earth. The existence of vegetation in these areas presents special problems to remote sensing systems since geologic bedrock and alteration zones are masked. At times, however, alterations in the soil/sediment geochemical environment result in foliar chemical changes that are detectable via remote sensing. Examples include monitoring of chlorophyll reflectance/fluorescence and equivalent water thickness indices as indicators of drought-induced plant stress. Another processing and interpretation approach used with hyperspectral data has been

principal components analysis (PCA). Rowan et al. used PCA to identify absorption feature patterns obtained from vegetated areas with discrete bedrock geology or mineralization as the substrate. Many researchers highlight the need to advance our ability for hyperspectral imaging in vegetated areas as a near-term priority.
Author
Principal Components Analysis; Remote Sensing; Spectral Reflectance; Vegetation; Earth Observations (From Space); Adsorption

20020045165 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Adaptive HSI Data Processing for Near-Real-Time Analysis and Spectral Recovery
Hsu, Su May, Massachusetts Inst. of Tech., USA; Burke, Hsiao-Hua, Massachusetts Inst. of Tech., USA; Griffin, Michael, Massachusetts Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 229-238; In English; Also announced as 20020045138; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

   Hyperspectral imaging (HSI) sensors collect spatially resolved data in hundreds of spectral channels. While the technology matures and finds broad applications, data downlink from the collection platform and near real-time processing remain key challenges, especially for near-term spaceborne sensors. It is desirable to process the data onboard for near-real-time analysis and downlink compressed data allowing near full spectral recovery for postmission analysis. Principal component analysis (PCA) can be used to determine the reduced dimensionality and separate noise components in the data. While PCA is useful for image feature analysis such as smoke/cloud discrimination, it can also be used as a data compression tool. With PCA, the majority of information in an HSI data cube is effectively compressed to a small number of principal components. The data volume is significantly reduced while the feature contrast is enhanced. Spectral information can be recovered from the compressed data with minimal loss. In this paper, the reconstructed data are compared to the original 'truth' data with difference analysis using sample AVIRIS imagery. This methodology also allows for the HSI data to be used adaptively for various multispectral band simulations without the constraint of data volume and processing burden. Based on AVIRIS data, emulation of MODIS sensor bands are carried out and compared with the PCA-reconstructed data. Two products are also derived and compared: Normalized Difference Vegetation Index (NDVI) and the integrated column water vapor (CWV) using the full set of AVIRIS data and the reconstructed spectral information.
Author
Data Compression; Data Processing; Imaging Techniques; Principal Components Analysis; Earth Observations (From Space); Spectrum Analysis

20020045166 Geological Survey, Denver, CO USA
The Effects of Temporal Sampling and Changing Spatial Scales on the Mapping of Forest Cover in Yellowstone National Park Using Imaging Spectroscopy
Kokaly, Raymond F., Geological Survey, USA; Clark, Roger N., Geological Survey, USA; Despain, Don G., Geological Survey, USA; Livo, K. Eric, Geological Survey, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 239-252; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

   The US Geological Survey (USGS), in cooperation with the National Park Service, is using imaging spectroscopy to advance the understanding of the geologic features and biologic systems in Yellowstone National Park. Kokaly et al. presented the methods and results of applying imaging spectroscopy to the study of the biotic components of Yellowstone National Park. Knowledge of the distribution of vegetation such as whitebark pine is desired for understanding the habitat and movements of grizzly bears, bison, and other large mammals. This paper addresses several questions regarding the mapping of forest cover in Yellowstone National Park (Yellowstone) using imaging spectroscopy, including: (1) How do the spectral signatures of conifer forest stands differ when changing the spatial scale and temporal sampling of Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) data? (2) Can conifer forest cover types be robustly identified in high spatial resolution AVIRIS data using the USGS Tetracorder system and a vegetation spectral library derived from a lower spatial resolution data set? and (3) How do maps of forest cover derived from low and high spatial resolution AVIRIS data compare?
Author
Forests; Imaging Techniques; Infrared Imagery; Spectroscopy; Spectrum Analysis; Earth Observations (From Space); Remote Sensing

20020045168 NASA Goddard Space Flight Center, Greenbelt, MD USA
Hyperspectral Image Classification using a Self-Organizing Map
Martinez, P., Universidad de Extremadura, Spain; Gualtieri, J. A., NASA Goddard Space Flight Center, USA; Aguilar, P. L.,

Universidad de Extremadura, Spain; Perez, R. M., Universidad de Extremadura, Spain; Linaje, M., Universidad de Extremadura, Spain; Preciado, J. C., Universidad de Extremadura, Spain; Plaza, A., Universidad de Extremadura, Spain; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 267-274; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The use of hyperspectral data to determine the abundance of constituents in a certain portion of the Earth's surface relies on the capability of imaging spectrometers to provide a large amount of information at each pixel of a certain scene. Today, hyperspectral imaging sensors are capable of generating unprecedented volumes of radiometric data. The Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), for example, routinely produces image cubes with 224 spectral bands. This undoubtedly opens a wide range of new possibilities, but the analysis of such a massive amount of information is not an easy task. In fact, most of the existing algorithms devoted to analyzing multispectral images are not applicable in the hyperspectral domain, because of the size and high dimensionality of the images. The application of neural networks to perform unsupervised classification of hyperspectral data has been tested by several authors and also by us in some previous work. We have also focused on analyzing the intrinsic capability of neural networks to parallelize the whole hyperspectral unmixing process. The results shown in this work indicate that neural network models are able to find clusters of closely related hyperspectral signatures, and thus can be used as a powerful tool to achieve the desired classification. The present work discusses the possibility of using a Self Organizing neural network to perform unsupervised classification of hyperspectral images. In sections 3 and 4, the topology of the proposed neural network and the training algorithm are respectively described. Section 5 provides the results we have obtained after applying the proposed methodology to real hyperspectral data, described in section 2. Different parameters in the learning stage have been modified in order to obtain a detailed description of their influence on the final results. Finally, in section 6 we provide the conclusions at which we have arrived.
Derived from text
Algorithms; Image Classification; Neural Nets; Data Processing

20020045169 California Univ., Earth Sciences Dept., Santa Cruz, CA USA
Hyperspectral Remote Sensing in Long Valley Caldera: Issues of Scale, Resolution, and Signal to Noise
Martini, Brigette A., California Univ., USA; Silver, Eli A., California Univ., USA; Potts, Donald C., California Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 275-282; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This study focuses primarily on the study, monitoring, and hazard evaluation of active volcanic regions using airborne hyperspectral imagery. The age of hyperspectral satellites is now a reality, and as such, it is important to test this technology's strengths and weaknesses as a viable tool in the hands of volcanologists studying active volcanic regions all over the world. Though one satellite (NASA's Hyperion) is now flying, little data has been seen by the scientific community at large. Other hyperspectral satellites have imminent launch dates; however until more spaceborne data is available, airborne data that approximates spaceborne instrument characteristics can be used to study volcanic regions of interest. The datasets used in this study image Long Valley Caldera and the Mono-Inyo Volcanic chain located in central-eastern California. The Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) and HyMap data vary in spatial resolution, instrument signal-to-noise ratios and spectral sampling. Though the exact characteristics of various spaceborne satellites are not matched, they are close enough to draw important conclusions regarding hyperspectral imaging's abilities as a volcanology tool. We compare spatial resolution of the instruments and relate that to the scale of the problems and phenomena being studied.
Author
Airborne Equipment; Remote Sensing; Volcanoes; Earth Observations (From Space); Imaging Techniques

20020045170 Raytheon Co., USA
Decision Tree Classification of Multidate AVIRIS Data for Mapping Woodland Encroachment into the Great Plains
Meyer, David, Raytheon Co., USA; Wylie, Bruce, Raytheon Co., USA; Robbins, Cullen, Raytheon Co., USA; Vierling, Lee, South Dakota School of Mines and Technology, USA; Kozak, Patrick, South Dakota School of Mines and Technology, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 283-287; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Mapping the eastern red cedar throughout the Great Plains using remote observation techniques can be problematic for several reasons. First, in the early stages of encroachment, the species is either hidden under deciduous overstory, or expressing itself only through isolated, patchy occurrences in open areas. Its spectral signature is not always distinct from other conifer species as viewed by lower-dimensional multispectral instruments, although throughout much of the plains, there are few other conifers co-occurring with the juniper in large numbers. However, one of its prime expansion corridors is along the riparian systems that cut west-to-east across the central plains. At some point, the eastern red cedar can co-occur with western conifers, such as the

ponderosa pine. This is the case along the Niobrara River in Nebraska, a unique riparian system where eastern hardwoods can intermix with western conifers. The Niobrara and other rivers are important conduits to juniper expansion to the west, but present all the problems associated with remote detection: patchiness, overstory obscuration, and spectral confusion. The problem of remote detection is approached here using high spectral resolution to improve spectral discrimination, and leaf-on, leaf-off data acquisitions at high spatial resolution to identify the eastern red cedar under varying conditions of background spectra and overstory obscuration. The primary instrument for this study is the Advanced Visible and Infrared Imaging Spectrometer (AVIRIS) coupled with field observations of juniper stands.

Derived from text

Infrared Imagery; Remote Sensing; Spectral Signatures; Forests; Earth Observations (From Space); Deciduous Trees

20020045171 Boeing-Autometric, Inc., Colorado Springs, CO USA

Using AVIRIS Data to Map Geologic Signatures of Copper Flat Porphyry Copper Deposit, Hillsboro, New Mexico

Penn, Brian S., Boeing-Autometric, Inc., USA; Livo, K. Eric, Geological Survey, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 289-298; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The most popular software package for processing hyperspectral imagery is the Environment for Visualizing Imagery (ENVI) available from Research Systems, Inc. Other lesser-known software packages are available including the system developed at the USGS Spectroscopy Laboratory called Tetracorder (previously known as Tricorder). Tetracorder does not enjoy the notoriety of ENVI primarily because Tetracorder is a USGS in-house tool used almost exclusively by the members of the USGS Spectroscopy Laboratory. Tetracorder has been used successfully on a number of studies including the Summitville mine in southwestern Colorado, the Leadville superfund site and Yellowstone Park. Another relatively unknown approach, but of interest because of its unique classification capabilities, are Kohonen self-organizing maps (SOM). Each of these techniques was applied to the AVIRIS imagery of Copper Flat porphyry copper deposit (CFPCID) in south-central New Mexico. The ENVI process is well documented, but it is still reviewed here. Since Tetracorder has not been publicly released, only the essential elements are described in any detail. The details of SOM are shown below. Although SOM are not a complete system, when used in conjunction with ENVI, they prove to be a useful addition to any hyperspectral toolkit.

Author

Applications Programs (Computers); Imaging Techniques; Spectral Signatures; Remote Sensing; Earth Observations (From Space); Self Organizing Systems

20020045172 Environmental Protection Agency, Landscape Characterization Branch, Research Triangle Park, NC USA

Land Cover Image Endmembers in AVIRIS Imagery in the Neuse River Basin, North Carolina

Pilant, Andrew, Environmental Protection Agency, USA; Lunetta, Ross, Environmental Protection Agency, USA; Slonecker, Terrence, Environmental Protection Agency, USA; Streicher, John, National Oceanic and Atmospheric Administration, USA; Iiames, John, Environmental Protection Agency, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 299-307; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The US Environmental Protection Agency (EPA) National Exposure Research Laboratory (NERL) is conducting hyperspectral remote sensing (imaging spectroscopy) methods development research in the Neuse River Basin, North Carolina. Science objectives have focused on the potential applications of hyperspectral imagery for vegetation discrimination in biologically diverse ecosystems. Imagery was collected by NASA's Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) on July 20, 1999 along a single northwest-southeast oriented flight line in the Atlantic Coastal Plain between New Bern and Kinston, North Carolina. Overall research goals include the evaluation of well-characterized and high signal-to-noise AVIRIS data for vegetative community discrimination and to evaluate (simulation) the potential application of Moderate Resolution Imaging Spectroradiometer (MODIS)-based spectral unmixing for vegetation discrimination in the broader Albemarle-Pamlico Basin (APB). The analysis presented here was directed at extracting a suite of AVIRIS-derived spectral image endmembers from a full scene and determining the land cover class of pixels belonging to each endmember. Image endmembers are the purest pixels in a scene, and can be used as reference spectra in spectral unmixing and land cover mapping. The sections that follow detail the reflectance calibration, the data reduction process, the interactive selection of endmembers, and the land cover class labeling of endmember pixels by comparison with a coregistered land cover/land use (LCLU) map. We close with a discussion of the resultant AVIRIS image endmembers and factors that contributed to endmember emergence from the background data.

Author

Imaging Techniques; Infrared Imagery; Land Use; Remote Sensing; Earth Observations (From Space)

20020045173 NASA Goddard Space Flight Center, Greenbelt, MD USA

Spatial/Spectral Identification of Endmembers from AVIRIS Data using Mathematical Morphology

Plaza, Antonio, Universidad de Extremadura, Spain; Martinez, Pablo, Universidad de Extremadura, Spain; Gualtieri, J. Anthony, NASA Goddard Space Flight Center, USA; Perez, Rosa M., Universidad de Extremadura, Spain; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 309-319; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

   During the last several years, a number of airborne and satellite hyperspectral sensors have been developed or improved for remote sensing applications. Imaging spectrometry allows the detection of materials, objects and regions in a particular scene with a high degree of accuracy. Hyperspectral data typically consist of hundreds of thousands of spectra, so the analysis of this information is a key issue. Mathematical morphology theory is a widely used nonlinear technique for image analysis and pattern recognition. Although it is especially well suited to segment binary or grayscale images with irregular and complex shapes, its application in the classification/segmentation of multispectral or hyperspectral images has been quite rare. In this paper, we discuss a new completely automated methodology to find endmembers in the hyperspectral data cube using mathematical morphology. The extension of classic morphology to the hyperspectral domain allows us to integrate spectral and spatial information in the analysis process. In Section 3, some basic concepts about mathematical morphology and the technical details of our algorithm are provided. In Section 4, the accuracy of the proposed method is tested by its application to real hyperspectral data obtained from the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) imaging spectrometer. Some details about these data and reference results, obtained by well-known endmember extraction techniques, are provided in Section 2. Finally, in Section 5 we expose the main conclusions at which we have arrived.
Derived from text
Algorithms; Image Analysis; Imaging Techniques; Morphology; Remote Sensing; Data Processing

20020045174 Curtin Univ. of Technology, Remote Sensing and Satellite Research Group, Perth, Australia

Determining Atmospheric Column Water Vapour in the 0.4-2.5 Micrometer Spectral Region

Rodger, Andrew, Curtin Univ. of Technology, Australia; Lynch, Mervyn J., Curtin Univ. of Technology, Australia; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 321-330; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

   To derive the surface spectral reflectance rho(lambda) from the radiance received at-sensor L(lambda), correction is required for the effects of scattering and absorption. In the 400 to 2500 nm spectral region there are five major absorbing species, with the largest absorber being atmospheric water vapor. The atmospheric water vapor is highly variable both spatially and temporally and has the effect of modifying the solar irradiance at the surface, which leads to the requirement to estimate the atmospheric column water vapor on a per pixel basis. Current methods for water vapor estimation include the Continuum Interpolated Band Ratio (CIBR) and the Narrow/Wide and Atmospheric Pre-Corrected Differential Absorption (APDA) technique. All of the methods make use of differential absorption techniques, though a limiting factor is the way they are applied across a given atmospheric water vapor absorption feature; usually the 940 and 1130 nm absorption features. The accepted techniques use measurement channel/s and reference channel/s as described by Schlapfer. One of the limiting factors of the traditional techniques is that only one estimate of column water vapor is gained for each water vapor absorption feature. This doesn't allow rejection schemes to be utilized or outliers to be readily identified. The use of linear interpolation across a given absorption feature to provide background surface reflectance slopes can also lead to problems when the surface under consideration has surface absorption features close to the atmospheric water vapor absorption features, this occurs with vegetated surfaces, etc. Both of these problems may be overcome by modifying the form of the differential technique used, which in turn allows more of the 400 to 2500 nm spectral region to be utilized for the estimation of atmospheric column water vapor.
Author
Atmospheric Moisture; Spectral Bands; Spectral Reflectance; Water Vapor; Remote Sensing

20020045177 Prairie View Agricultural and Mechanical Coll., Texas Gulf Coast Environmental Data Center, TX USA

Characteristics of AVIRIS Band Measurements in Desert Agroecosystems in the Area of Blythe, California, 1, Studies of Cotton Spectra

Hanna, Safwat H. Shakir, Prairie View Agricultural and Mechanical Coll., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 351-365; In English; Also announced as 20020045138; Original contains color illustrations

Contract(s)/Grant(s): NAGW-13; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

   Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data from Blythe, California, were acquired in June 1997 to study agricultural spectra from different crops and to identify crops in other areas with similar environmental factors and similar spectral

properties. The main objectives of this study are: (1) to compare the spectral and radiometric characteristics of AVIRIS data from agriculture crops with ground spectra measured by a FieldSpec ASD spectrometer; (2) to explore the use of AVIRIS spectral images for identifying agricultural crops; (3) to study the spectral expression of environmental factors on selected crops; and (4) to build a spectral library for the crops that were studied. A long-term goal is to extend the spectral library for different vegetation or crops in different stages of growth. to support our study, on July 18 and 19, 2000, we collected spectra using the FieldSpec spectrometer from selected fields with different crops in the Blythe area of California (longitude 114 deg 33.28 W and latitude 33 deg 25.42 N to longitude 1140 44.53 W and latitude 33 deg 39.77 N). These crops were cotton in different stages of growth, varieties of grass pure or mixed, Sudan grass, Bermuda grass, Teff grass, and alfalfa. Some of the fields were treated with different types of irrigation (i.e., wet to dry conditions). Additional parameters were studied such as the soil water content (WC), pH, and organic matter (OM). The results of this study showed that for crops known to be similar, there is a significant correlation between the spectra that were collected by AVIRIS in 1997 and spectra measured by the FieldSpec (registered) spectrometer in 2000. This correlation allowed development of a spectral library to be used in ENVI-IDL analysis software. This library was used successfully to identify different crops. Furthermore, using IDL algorithms of Spectral Angle Mapper classification (SAM), spectral feature fitting (SFF) and spectral binary encoding (SPE) showed that there is excellent agreement between the predicted and the actual crop type (i.e., the correlation is between 85-90% match). Further use of the AVIRIS images can be of a value to crop identification or crop yield for commercial use.
Author
Crop Identification; Infrared Imagery; Libraries; Spectra; Earth Observations (From Space); Remote Sensing; Reflectance

20020045178 Nevada Univ., Arthur Brant Lab. for Exploration Geophysics, Reno, NV USA
Preliminary Results of Hydrothermal Alteration Assemblage Classification in Aurora and Bodie Mining Districts, Nevada and California, with Airborne Hyperspectral Data
Smailbegovic, Amer, Nevada Univ., USA; Taranik, James V., Nevada Univ., USA; Calvin, Wendy M., Nevada Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 367-374; In English; Also announced as 20020045138; Sponsored in part by Nevada Space Grant Consortium; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Aurora and Bodie mining districts are located in Bodie Hills, north of Mono Lake, on opposite sides of the Nevada-California state line. From the standpoint of economic geology, both deposits are structurally controlled, low-sulfidation, adularia-sericite precious metal vein deposits with an extensive alteration halo. The area was exploited from the late 1870's until 1988 by both underground and minor open pit operations (Aurora), exposing portions of ore-hosting altered andesites, devitrified rhyolites as well as quartz-adularia-sericite veins. Much of the geologic mapping and explanation was ad hoc and primarily in support of the mining operations, without particular interest paid to the system as a whole. The University of Nevada, Reno has acquired both high- and low-altitude Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data of the region. Low-altitude data was acquired in July 2000, followed by high-altitude collection in October 2000. The AVIRIS coverage was targeted on the main vein system in Aurora (Prospectus and Humboldt Vein), East Brawley Peak prospect (midpoint between Aurora and Bodie) and 'Bonanza Zone' (Bodie Bluff and Standard Hill) in Bodie, where the hydrothermal alteration zones appear to be the most pervasive. The ground-observations and mining/prospecting reports suggest propylitic alteration throughout the Bodie Hills, argillic and potassic alteration in Aurora and Bodie, (low-sulfidation system) and alunitic alteration (high-sulfidation system) on East Brawley Peak. The AVIRIS data allows identification of alteration zones containing dominant kaolinite, sericite (Aurora), alunite (E. Brawley Peak) and Na and Ca-montmorillonite (Bodie), which have been verified with ASD spectrometer and XRD analysis on field collected samples. Spectral mapping is somewhat hindered by anthropogenic factors (mine dumps and reclamation efforts) and coatings (heavy varnish and pyroclastic 'sand' from Inyo Craters). We will present the mapping results from the high-altitude data set and an initial comparison to the low-altitude scene.
Author
Geological Surveys; Infrared Imagery; Mining; Earth Observations (From Space); Remote Sensing; Minerals

20020045179 Columbia Univ., Lamont Doherty Earth Observatory, Palisades, NY USA
Spectral Dimensionality and Scale of Urban Radiance
Small, Christopher, Columbia Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 375-385; In English; Also announced as 20020045138; Original contains color illustrations; Sponsored in part by Columbia Earth Inst.; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Characterization of urban radiance and reflectance is important for understanding the effects of solar energy flux on the urban environment as well as for satellite mapping of urban settlement patterns. Spectral mixture analyses of LANDSAT and Ikonos imagery suggest that the urban radiance field can very often be described with combinations of three or four spectral endmembers.

Dimensionality estimates of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) radiance measurements of urban areas reveal the existence of 30 to 60 spectral dimensions. The extent to which broadband imagery collected by operational satellites can represent the higher dimensional mixing space is a function of both the spatial and spectral resolution of the sensor. AVIRIS imagery offers the spatial and spectral resolution necessary to investigate the scale dependence of the spectral dimensionality. Dimensionality estimates derived from Minimum Noise Fraction (MNF) eigenvalue distributions show a distinct scale dependence for AVIRIS radiance measurements of Milpitas, California. Apparent dimensionality diminishes from almost 40 to less than 10 spectral dimensions between scales of 8000 m and 300 m. The 10 to 30 m scale of most features in urban mosaics results in substantial spectral mixing at the 20 m scale of high altitude AVIRIS pixels. Much of the variance at pixel scales is therefore likely to result from actual differences in surface reflectance at pixel scales. Spatial smoothing and spectral subsampling of AVIRIS spectra both result in substantial loss of information and reduction of apparent dimensionality, but the primary spectral endmembers in all cases are analogous to those found in global analyses of LANDSAT and Ikonos imagery of other urban areas.
Author
Cities; Imagery; Radiance; Spectral Signatures; Spectral Reflectance; Earth Observations (From Space); Remote Sensing

20020045180 Lockheed Martin Space Operations, Bay Saint Louis, MS USA
Low-Altitude AVIRIS Data for Mapping Land Cover in Yellowstone National Park: Use of Isodata Clustering Techniques
Spruce, Joseph P., Lockheed Martin Space Operations, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 387-396; In English; Also announced as 20020045138
Contract(s)/Grant(s): NAS13-650; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Northeast Yellowstone National Park (YNP) has a diversity of forest, range, and wetland cover types. Several remote sensing studies have recently been done in this area, including the NASA Earth Observations Commercial Applications Program (EOCAP) hyperspectral project conducted by Yellowstone Ecosystems Studies (YES) on the use of hyperspectral imaging for assessing riparian and in-stream habitats. In 1999, YES and NASA's Commercial Remote Sensing Program Office began collaborative study of this area, assessing the potential of synergistic use of hyperspectral, synthetic aperture radar (SAR), and multiband thermal data for mapping forest, range, and wetland land cover. Since the beginning, a quality 'reference' land cover map has been desired as a tool for developing and validating other land cover maps produced during the project. This paper recounts an effort to produce such a reference land cover map using low-altitude Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data and unsupervised classification techniques. The main objective of this study is to assess ISODATA classification for mapping land cover in Northeast YNP using select bands of low-altitude AVIRIS data. A secondary, more long-term objective is to assess the potential for improving ISODATA-based classification of land cover through use of principal components analysis and minimum noise fraction (MNF) techniques. This paper will primarily report on work regarding the primary research objective. This study focuses on an AVIRIS cube acquired on July 23, 1999, by the confluence of Soda Butte Creek with the Lamar River. Range and wetland habitats dominate the image with forested habitats being a comparatively minor component of the scene. The scene generally tracks from southwest to northeast. Most of the scene is valley bottom with some lower side slopes occurring on the western portion. Elevations within the AVIRIS scene range from approximately 1998 to 2165 m above sea level, based on US Geological Survey (USGS) 30-m digital elevation model (DEM) data. Despain and the National Park Service (NPS) provide additional description of the study area.
Author
Forests; Geological Surveys; Habitats; Imaging Techniques; Remote Sensing; Thematic Mapping; Earth Observations (From Space)

20020045182 Stanford Univ., Dept. of Geological and Environmental Sciences, Palo Alto, CA USA
Mapping Arid Vegetation Species Distributions in the White Mountains, Eastern California, Using AVIRIS, Topography, and Geology
VandeVen, C., Stanford Univ., USA; Weiss, S. B., Creekside Center for Earth Observations, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 411-419; In English; Also announced as 20020045138
Contract(s)/Grant(s): NAG5-4888; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Our challenge is to model plant species distributions in complex montane environments using disparate sources of data, including topography, geology, and hyperspectral data. From an ecologist's point of view, species distributions are determined by local environment and disturbance history, while spectral data are 'ancillary.' However, a remote sensor's perspective says that spectral data provide picture of what vegetation is there, topographic and geologic data are ancillary. In order to bridge the gap, all available data should be used to get the best possible prediction of species distributions using complex multivariate techniques implemented on a GIS. Vegetation reflects local climatic and nutrient conditions, both of which can be modeled, allowing predictive mapping of vegetation distributions. Geologic substrate strongly affects chemical, thermal, and physical properties of

soils, while climatic conditions are determined by local topography. As elevation increases, precipitation increases and temperature decreases. Aspect, slope, and surrounding topography determine potential insolation, so that south-facing slopes are warmer and north-facing slopes cooler at a given elevation. Topographic position (ridge, slope, canyon, or meadow) and slope angle affect sediment accumulation and soil depth. These factors combine as complex environmental gradients, and underlie many features of plant distributions. Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data, digital elevation models, digitized geologic maps, and 378 ground control points were used to predictively map species distributions in the central and southern White Mountains, along the western boundary of the Basin and Range province. Minimum Noise Fraction (MNF) bands were calculated from the visible and near-infrared AVIRIS bands, and combined with digitized geologic maps and topographic variables using Canonical Correspondence Analysis (CCA). CCA allows for modeling species 'envelopes' in multidimensional environmental space, which can then be projected across entire landscapes.

Author

Emission Spectra; Multivariate Statistical Analysis; Remote Sensing; Slopes; Thematic Mapping; Topography; Vegetation; Earth Observations (From Space)

20020045183 Nevada Univ., Arthur Brant Lab. for Exploration Geophysics, Reno, NV USA

Analysis of Sub-Pixel Mixing in High-Altitude AVIRIS Data Over Virginia City, Nevada, Using Systematic Field-Based Observations

Vaughan, R. Greg, Nevada Univ., USA; Calvin, Wendy M., Nevada Univ., USA; Taranik, James V., Nevada Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 421-426; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In 1995 Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data were acquired over Virginia City, Nevada at a 20-km altitude above sea level. The average elevation of the scene is about 2 km, so the resultant size of a pixel is 18 x 18 sq m - about the size of a tennis court. One of the important questions to ask about such remote sensing data is how the effects of sub-pixel scale mixing will affect the ability to create an accurate mineral map. Pixel-scale mineralogic heterogeneity results in a spectrum that is a function of all the different materials that make up that pixel. Additionally, heterogeneity at the hand-sample scale can be recognized with field spectrometer analyses in the field or in the laboratory. This report describes methods used for the systematic sampling of a field site and the results of modeling the spectra of a heterogeneous area with linear mixtures of measured end-member spectra.

Author

Heterogeneity; Pixels; Remote Sensing; Earth Observations (From Space)

20020045184 Colorado School of Mines, Golden, CO USA

Mapping Minerals at the Copper Flat Porphyry, New Mexico, using AVIRIS Data

Verdel, Charles S., Colorado School of Mines, USA; Knepper, Daniel, Jr., Geological Survey, USA; Livo, K. Eric, Geological Survey, USA; McLemore, Virginia T., New Mexico Bureau of Mines and Mineral Resources, USA; Penn, Brian, Autometric, Inc., USA; Keller, Randy, Texas Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 427-433; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Copper Flat porphyry is a Laramide copper deposit in southwest New Mexico. High-altitude Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data were acquired over the site in 1998. Limonite minerals, carbonates, some phyllosilicates, epidote, gypsum, and tremolite/talc have been preliminarily mapped based on AVIRIS data. The results indicate a fairly regular zonation of hydrothermal alteration minerals around the porphyry that is consistent with classic models of alteration from porphyry copper deposits. Verification of the preliminary results is on-going. X-ray diffraction analyses and laboratory spectral analyses will be performed on samples from the area in order to confirm the results of mineral mapping.

Author

Mineral Deposits; Spectrum Analysis; Thematic Mapping; Earth Observations (From Space); Remote Sensing

20020045185 Eastman Kodak Co., Rochester, NY USA

Spectral Band Characterization for Hyperspectral Monitoring of Water Quality

Vermillion, Stephanie C., Eastman Kodak Co., USA; Raqueno, Rolando, Rochester Inst. of Tech., USA; Simmons, Rulon, Eastman Kodak Co., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 435-443; In English; Also announced as 20020045138

Contract(s)/Grant(s): NAS13-98080; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A method for selecting the set of spectral characteristics that provides the smallest increase in prediction error is of interest to those using hyperspectral imaging (HSI) to monitor water quality. The spectral characteristics of interest to these applications are spectral bandwidth and location. Three water quality constituents of interest that are detectable via remote sensing are chlorophyll (CHL), total suspended solids (TSS), and colored dissolved organic matter (CDOM). Hyperspectral data provides a rich source of information regarding the content and composition of these materials, but often provides more data than an analyst can manage. This study addresses the spectral characteristics need for water quality monitoring for two reasons. First, determination of the greatest contribution of these spectral characteristics would greatly improve computational ease and efficiency. Second, understanding the spectral capabilities of different spectral resolutions and specific regions is an essential part of future system development and characterization. As new systems are developed and tested, water quality managers will be asked to determine sensor specifications that provide the most accurate and efficient water quality measurements. We address these issues using data from the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) and a set of models to predict constituent concentrations.
Author
Characterization; Imaging Techniques; Remote Sensing; Spectra; Water Quality; Earth Observations (From Space)

20020045187 California Univ., Center for Spatial Technologies and Remote Sensing, Davis, CA USA

Correlating AVIRIS Imagery to Field Sampling and Spectrometer Measurements for Inorganic Soil Carbon

Whiting, Michael L., California Univ., USA; Ustin, Susan L., California Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 455-461; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The AG2020 USDA and NASA program sponsors the advancement of remote sensing and other spatial technologies to enhance precision farming and sustainability. This affiliated study in the San Joaquin Valley (http://www.ag2020.net) is through the leadership of the National Cotton Council and the cooperating farm manager. Both contribute funding support and in-kind services. The majority of support is from the 23+ investigators who volunteer time and their own research funding for this collaborative effort. The list of cooperating organizations includes: NASA-JPL through AVIRIS and other imagery contributions; USDA - Agricultural Research Service, at Shafter Research Field Station, studying the use of hyperspectral imaging for the detection of plant stress and disease through their own airborne multispectral scanner and contracting of additional hyperspectral imagery and analysis from Opto-Knowledge Systems, Inc. (OKSI). The University of California Cooperative Extension, and UC Department of Agriculture and Natural Resources, and Kings County Farm Advisor have contributed staff in nutrient status and ground measurements. The University of California, Davis facility in the Departments of Agronomy and Range Science, and Land, Air and Water Resources are studying soil and plant nutrient through remote sensing, and amendment and fertilizer trials. Many investigators have joint studies among these organizations, including Center for Spatial Technology and Remote Sensing (CSTARS), joining in remote sensing of soil quality and plant stress. This report is a brief description of one field study, soil surface spectra and sampling conducted in July 2000. The status of lab and image data, and initial findings in the relationships between soil chemical analysis and spectra for the study site, are also discussed.
Derived from text
Imaging Techniques; Remote Sensing; Soils; Earth Observations (From Space)

20020045188 York Univ., Center for Earth and Space Science, Toronto, Ontario Canada

Chlorophyll a+b Content Estimation Through Turbid-Medium and Monte-Carlo RT Model Inversion for Forest Canopies, using Hyperspectral Data

Zarco-Tejada, Pablo J., York Univ., Canada; Miller, John R., York Univ., Canada; Harron, John, York Univ., Canada; Hu, Bao-Xin, York Univ., Canada; Noland, Thomas L., Ontario Forest Research Inst., Canada; Goel, Narendra, Wayne State Univ., USA; Mohammed, Gina H., Ontario Forest Research Inst., Canada; Sampson, Paul H., Ontario Forest Research Inst., Canada; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 463-466; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

This paper reports on progress made within the Bioindicators of Forest Sustainability Project to develop links between physiologically-based bio-indicators (e.g., pigment concentrations, chlorophyll fluorescence) from field and laboratory data and optical indices from hyperspectral remote sensing data for assessing forest condition.
Derived from text
Chlorophylls; Forests; Remote Sensing

20020045382 Woods Hole Oceanographic Inst., MA USA

Recent Sedimentation and Stratigraphic Development in the Arabian Gulf *Final Report, 1 May 2000-31 Dec. 2001*

Swift, Stephen A.; Ross, David A.; Dec. 2001; 11p; In English; Original contains color images

Contract(s)/Grant(s): N00014-00-1-0726

Report No.(s): AD-A400715; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The Persian/Arabian Gulf is subsiding in response to the collision between the Arabian and Asian plates and to growth during the last 5-10 years of the Zagros mountains. Uplifted fold belts, thickened continental crust, and poorly understood subcrustal loads depress the northeast edge of the Arabian plate creating, by lithospheric plate flexure, a foreland basin that is filled to the southeast with the shallow Gulf sea and to the northwest with sediment deposited by the Mesopotamian river system. The stratigraphy of Neogene sediments within the Gulf is clearly affected by the tectonics of the collision and mountain building.

DTIC

Sediments; Stratigraphy; Tectonics; Gulfs; Folds (Geology)

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20020044125 Little (Arthur D.), Inc., Cambridge, MA USA

Thermal Management Considerations in Energy Conversion Devices

Pellizzari, Roberto; May 2001; 13p; In English; Thermal Materials Workshop 2001, 30 May - 1 Jun. 2001, Cambridge, UK; Original contains color images; See Also ADM001348. Additional papers can be downloaded from: http://www-mech.eng.cam.ac.uk/onr/. --Original contains color plates: All DTIC reproductions will be in black and white. Contains viewgraphs only

Report No.(s): AD-A400320; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Thermal management issues are critical to all of the energy conversion technologies competing in the micro-power range (is less than 1000 W). This discussion will focus on the thermal management considerations relevant to closed cycle thermal conversion devices.

DTIC

Closed Cycles; Energy Conversion; Temperature Control

20020045485 Pennsylvania State Univ., Dept. of Physics, University Park, PA USA

Stack/Heat-Exchanger Research for Thermoacoustic Heat Engines *Final Report, 1 Oct. 1996-30 Sep. 2001*

Maynard, Julian D.; Apr. 07, 2002; 20p; In English

Contract(s)/Grant(s): N00014-97-1-0008

Report No.(s): AD-A400800; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The goal of this project was to develop novel configurations of heat pumping elements and heat exchangers for thermoacoustic heat engines. The approach involved the use anisotropic systems employing innovative technology. The approach allowed a heat exchange fluid to flow directly across the heat pumping element of the thermoacoustic heat engine (the 'stack'), eliminating the necessity of separate heat exchangers and improving efficiency. The research has led to a radically new design, which is robust (using stainless steel and durable materials), relatively easy to fabricate, an employs a filament array or 'pin' stack. One patent has been awarded, and a second is in process. Several companies which can fabricate crucial components for future refrigerators were identified in the course of the research. The research formed the basis for a Ph.D. thesis.

DTIC

Heat Engines; Heat Exchangers; Refrigerating Machinery

Includes atmospheric, water, soil, noise, and thermal pollution.

20020045012 Scripps Institution of Oceanography, La Jolla, CA USA

On the Global Oxygen Anomaly and Air-Sea Flux

Garcia, Hernan E., Scripps Institution of Oceanography, USA; Keeling, Ralph F., Scripps Institution of Oceanography, USA; Journal of Geophysical Research; Dec. 15, 2001; ISSN 0148-0227; Volume 106, No. C12, pp. 31155-31166; In English

Contract(s)/Grant(s): NAG5-6668

Report No.(s): USJGOFS-Contrib-718; Paper-1999JC000200; Copyright; Avail: Issuing Activity

   A new climatology of monthly air-sea oxygen fluxes throughout the ice-free surface global ocean is presented. The climatology is based on weighted linear least squares regressions using heat flux monthly anomalies for spatial and temporal interpolation of historical O2 data. The seasonal oceanic variations show that the tropical belt (20 S - 20 N) is characterized by relatively small air-sea fluxes when compared to the middle to high latitudes (40 deg - 70 deg). The largest and lowest seasonal fluxes occur during summer and winter in both hemispheres. by means of an atmospheric transport model we show that our climatology is in better agreement with the observed amplitude and phasing of the variations in atmospheric O2/N2 ratios because of seasonal air-sea exchanges at baseline stations in the Pacific Ocean than with previous air-sea O2 climatologies. Our study indicates that the component of the air-sea O2 flux that correlates with heat flux dominates the large-scale air-sea O2 exchange on seasonal timescales. The contribution of each major oceanic basin to the atmospheric observations is described. The seasonal net thermal (SNO(sub T)) and biological (SNO(sub B)) outgassing components of the flux are examined in relation to latitudinal bands, basin-wide, and hemispheric contributions. The Southern Hemisphere's SNO(sub B) (approximately 0.26 Pmol) and SNO(sub T) (approximately 0.29 Pmol) values are larger than the Northern Hemisphere's SNO(sub B) (approximately 0.15 Pmol) and SNO(sub T) (approximately 0.16 Pmol) values (1 Pmol = 10(exp 15) mol). We estimate a global extratropical carbon new production during the outgassing season of 3.7 Pg C (1 Pg = 10(exp 15) g), lower than previous estimates with air-sea O2 climatologies.
Author (revised)

Air Water Interactions; Climatology; Oxygen; Annual Variations; Regression Analysis

20020045013 Scripps Institution of Oceanography, La Jolla, CA USA

Continuous Remote Measurements of Atmospheric O2 Concentrations in Relation to Interannual Variations in Biological Production and Carbon Cycling in the Oceans *Final Report, 15 Aug. 1997 - 14 Aug. 2001*

Keeling, Ralph F., Scripps Institution of Oceanography, USA; May 01, 2002; 8p; In English

Contract(s)/Grant(s): NAG5-6179

Report No.(s): Rept-97-1376; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   We successfully initiated a program to obtain continuous time series of atmospheric O2 concentrations at a semi-remote coastal site, in Trinidad, California. The installation, which was completed in September 1999, consists of a commercially-available O2 and CO2 analyzers interfaced to a custom gas handling system and housed in a dedicated building at the Trinidad site. Ultimately, the data from this site are expected to provide constraints, complementing satellite data, on variations in ocean productivity and carbon exchange on annual and interannual time scales, in the context of human-induced changes in global climate and other perturbations. The existing time-series, of limited duration, have been used in support of studies of the O2/CO2 exchange from a wild fire (which fortuitously occurred nearby in October 1999) and to quantify air-sea N2O and O2 exchanges related to coastal upwelling events. More generally, the project demonstrates the feasibility of obtaining semi-continuous O2 time series at moderate cost from strategic locations globally.
Author

Annual Variations; Atmospheric Composition; Carbon Cycle; Carbon Dioxide; Oxygen; Air Water Interactions

20020045181 California Univ., Center for Spatial Technologies and Remote Sensing, Davis, CA USA

The Role of Hyperspectral Data in Understanding the Global Carbon Cycle

Ustin, Susan L., California Univ., USA; Zarco-Tejada, Pablo J., California Univ., USA; Asner, Gregory P., Colorado Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 397-410; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

   A major challenge in predicting the consequences of global climate change is to accurately estimate carbon stocks and to predict future CO2 sequestration and dynamics. Climate dynamics and human activities drive changes in land cover and land use, creating unpredictable patterns of disturbance and environmental stresses in natural and managed ecosystems. These changes

affect carbon storage, the distribution of carbon in above and below ground compartments, ecosystem productivity, and biogeochemical cycles. A wide range of information is needed to monitor the carbon cycle from properties that regulate fluxes of CO2, to estimates of standing biomass, land cover types, and land use history. Satellite observations provide the only practical means to obtain a synoptic view of the Earth's ecosystems, their spatial distribution, extent, and temporal dynamics. Four priority areas have been identified where improved satellite observations of terrestrial landscapes could contribute to greatly reducing the uncertainties in the global carbon budget. These are: (1) land cover characterization at improved spatial resolution; (2) above-ground biomass estimates; (3) areal estimates of disturbance, disturbance type, and time period since the last disturbance; and (4) improved estimates of productivity and controls on productivity. While these categories do not exclusively require hyperspectral data, it can contribute to significant improvements in reducing uncertainties in each area.
Derived from text
Carbon Cycle; Carbon Dioxide; Climate Change; Climatology; Satellite Observation

20020045302 NASA Marshall Space Flight Center, Huntsville, AL USA
Urban Surface Radiative Energy Budgets Determined Using Aircraft Scanner Data
Luvall, Jeffrey C., NASA Marshall Space Flight Center, USA; Quattrochi, Dale A., NASA Marshall Space Flight Center, USA; Rickman, Doug L., NASA Marshall Space Flight Center, USA; Estes, Maury G., Universities Space Research Association, USA; [2002]; 2p; In English; Urban Heat Island Summit, 1-4 May 2002, Toronto, Ontario, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

   It is estimated that by the year 2025, 80% of the world's population will live in cities. The extent of these urban areas across the world can be seen in an image of city lights from the Defense Meteorological Satellite Program. In many areas of North America and Europe, it is difficult to separate individual cities because of the dramatic growth and sprawl of urbanized areas. This conversion of the natural landscape vegetation into man-made urban structures such as roads and buildings drastically alter the regional surface energy budgets, hydrology, precipitation patterns, and meteorology. One of the earliest recognized and measured phenomena of urbanization is the urban heat island (UHI) which was reported as early as 1833 for London and 1862 for Paris. The urban heat island results from the energy that is absorbed by man-made materials during the day and is released at night resulting in the heating of the air within the urban area. The magnitude of the air temperature difference between the urban and surrounding countryside is highly dependent on the structure of the urban area, amount of solar immolation received during the day, and atmospheric conditions during the night. These night time air temperature differences can be in the range of 2 to 5 C. or greater. Although day time air temperature differences between urban areas and the countryside exists during the day, atmospheric mixing and stability reduce the magnitude. This phenomena is not limited to large urban areas, but also occurs in smaller metropolitan areas. The UHI has significant impacts on the urban air quality, meteorology, energy use, and human health. The UPI can be mitigated through increasing the amount of vegetation and modification of urban surfaces using high albedo materials for roofs and paved surfaces. to understand why the urban heat island phenomenon exists it is useful to define the surface in terms of the surface energy budget. Surface temperature and albedo is a major component of the surface energy budget. Knowledge of it is important in any attempt to describe the radiative and mass fluxes which occur at the surface. Use of energy terms in modeling surface energy budgets allows the direct comparison of various land surfaces encountered in a urban landscape, from vegetated (forest and herbaceous) to non-vegetated (bare soil, roads, and buildings). These terms are also easily measured using remote sensing from aircraft or satellite platforms allowing one to examine the spacial variability. The partitioning of energy budget terms depends on the surface type. In natural landscapes, the partitioning is dependent on canopy biomass, leaf area index, aerodynamic roughness, and moisture status, all of which are influenced by the development stage of the ecosystem. In urban landscapes, coverage by man-made materials substantially alters the surface face energy budget. The remotely sensed data obtained from aircraft and satellites, when properly calibrated allows the measurement of important terms in the radiative surface energy budget a urban landscape scale.
Author
Energy Budgets; Remote Sensing; Ecosystems; Cities; Scanners

20020045489 Karta Technology, Inc., San Antonio, TX USA
Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations *Final Report*
O'Brien, Robert J., Karta Technology, Inc., USA; Wade, Mark D., Karta Technology, Inc., USA; Jan. 2002; 235p; In English; Prepared in collaboration with Karta Technologies, Inc., San Antonio, TX
Report No.(s): AD-A400721; IERA-RS-BR-SR-2001-0010; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

   This report serves as a guidance document for the preparation of mobile source air emissions inventories at U.S. Air Force installations. Air emissions inventories are prepared at Air Force installations to comply with Federal, State, and local air quality regulatory requirements. Inventories are also used in the implementation of various environmental programs, including pollution

prevention opportunities, emissions trading, risk assessments, and environmental auditing. Historically, most air emission inventories performed at U.S. Air Force installations have only targeted stationary sources. However, the need to conduct mobile source air emissions inventories is continually growing due to the increase in regulatory requirements associated with mobile sources. The purpose of this document is to provide a uniform and logical approach for preparing mobile source emissions inventories. The report provides recommended methodologies and emission factors for calculating actual emissions from the most common types of mobile sources found at Air Force installations, including aerospace ground equipment (AGE), aircraft flying operations, on-road vehicles, and non-road vehicles/equipment. The pollutants addressed in this report include both criteria pollutants and hazardous air pollutants.

DTIC

Air Pollution; Exhaust Emission; Aerospace Vehicles

46
GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20020044111 Lebedev Physical Inst., Moscow, Russia
Studies of Plasma Instability Process Excited by Ground Based High Power HF (Heating) Facilities *Final Report*
Gurevich, Aleksander; Mar. 03, 2000; 13p; In English
Contract(s)/Grant(s): F61775-99-WE026
Report No.(s): AD-A400217; SPC-99-4026; EOARD-SPC-99-4026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   This report results from a contract tasking P. N. Lebedev Physical Institute as follows: The contractor will investigate electron acceleration mechanisms. He will quantitatively compare his theoretical calculations to existing data from HF heating facilities at Arecibo, Puerto Rico, and, if possible, from SURA, near Nizhny Novgorod, Russia.

DTIC

Magnetohydrodynamic Stability; Electron Acceleration; Ionospheric Heating; High Frequencies

20020044430 Utah State Univ., Center for Atmospheric and Space Sciences, Logan, UT USA
Satellite Studies of Ionospheric Electric Fields and Neutral Winds *Final Report, 1 Apr. 1997 - 30 Sep. 2001*
Fejer, Bela G., Utah State Univ., USA; [2002]; 7p; In English
Contract(s)/Grant(s): NAG5-4469; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   We have studied mid- and low-latitude electrodynamic and neutral thermospheric dynamic processes using measurements on board the AE-E, DE-2, and UARS (Upper Atmosphere Research Satellite) satellites, and global convection and general circulation models. These studies have determined the morphology of the equatorial zonal electric fields, the response of equatorial plasma irregularities to magnetospheric disturbances, and the time dependent response of the mid- and low latitude electric fields to magnetospheric disturbances. We have also used extensive F region zonal and meridional wind data obtained by Wind Imaging Interferometer (WINDII) instrument on board the UARS to study the latitudinal dependence of daytime disturbance winds during magnetically disturbed periods and the general characteristics of the global thermospheric disturbance wind system during geomagnetically active periods. This project has supported the PhD thesis research of John Emmert.

Derived from text

Electric Fields; Earth Ionosphere; Thermosphere; Electrodynamics; Earth Magnetosphere

20020044542 NASA Ames Research Center, Moffett Field, CA USA
The Formation of Racemic Amino Acids by UV Photolysis of Interstellar Ice Analogs
Bernstein, Max P., NASA Ames Research Center, USA; Dworkin, Jason P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; Cooper, George, NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; [2001]; 18p; In English
Contract(s)/Grant(s): NCC2-1178; RTOP 344-37-00-07; RTOP 344-37-44-01; RTOP 344-38-12-04; RTOP 344-50-92-02; RTOP 274-52-01-09; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Small biologically relevant organic molecules including the amino acids glycine, alanine, and marine were formed in the laboratory by the UV (Ultraviolet) photolysis of realistic interstellar ice analogs, composed primarily of H_2O, and including CH_3OH, NH_3, and HCN, under interstellar conditions. N-formyl glycine, cycloserine (4-amino-3-isoxazolidinone), and glycerol

were detected before hydrolysis, and glycine, racemic alanine, racemic marine, glycerol, ethanolamine, and glyceric acid were found after hydrolysis. This suggests that some meteoritic amino acids (and other molecules) may be the direct result of interstellar ice photochemistry, expanding the current paradigm that they formed by reactions in liquid water on meteorite parent bodies.
Author
Amino Acids; Glycine; Optical Activity; Photolysis

20020044951 Washington Univ., Dept. of Atmospheric Science, Seattle, WA USA
Coordinated Parameterization Development and Large-Eddy Simulation for Marine and Arctic Cloud-Topped Boundary Layers *Final Report, 1 Apr. 1998 - 31 Mar. 2002*
Bretherton, Christopher S., Washington Univ., USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG1-2072; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
   The goal of this project was to compare observations of marine and arctic boundary layers with: (1) parameterization systems used in climate and weather forecast models; and (2) two and three dimensional eddy resolving (LES) models for turbulent fluid flow. Based on this comparison, we hoped to better understand, predict, and parameterize the boundary layer structure and cloud amount, type, and thickness as functions of large scale conditions that are predicted by global climate models. The principal achievements of the project were as follows: (1) Development of a novel boundary layer parameterization for large-scale models that better represents the physical processes in marine boundary layer clouds; and (2) Comparison of column output from the ECMWF global forecast model with observations from the SHEBA experiment. Overall the forecast model did predict most of the major precipitation events and synoptic variability observed over the year of observation of the SHEBA ice camp.
Derived from text
Atmospheric Boundary Layer; Climate Models; Clouds (Meteorology); Large Eddy Simulation; Marine Meteorology; Parameterization; Weather Forecasting

20020045156 Brazil Univ., Dept. de Geografia, Brasilia Brazil
Rejection Basin Detection using the Integral Spectral Analysis (ISA) Method, Niquelandia, Brazil
Guimaraes, Renato Fontes, Brazil Univ., Brazil; AbiliodeCarvalho, Osmar, Jr., Brazil Univ., Brazil; Ferreira, Ana Paula Martins, Instituto Nacional de Colonizacaoe Reforma Agraria, Brazil; NobredeCostaRibeiro, Mucio, Brazil Univ., Brazil; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 141-144; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
   Niquelandia lateritic nickel deposits lie in the central portion of Brazil's Goias State, about 23 km north of Niquelandia city. The Niquelandia Complex is a well-exposed, large, layered intrusion in central Brazil that comprises an area of about 1,800 square km and is approximately 15 km thick. Geology and petrology studies showed many similarities between the Niquelandia Complex and well-known Precambrian layered intrusions such as Bushveld and Stillwater. Nevertheless, these layered intrusions (the Niquelandia Complex) show widespread tectonism, and associated amphibolite to granulite facies metamorphism. Deposits are located in the ultrabasic zone of the Niquelandia Basic-Ultrabasic Complex as a result of the residual concentration developed by rocks weathering in this zone. There are two types of ore: garnerite and oxidated ore. In 1973 the Niquel Tocantins Company built a metallurgic complex to produce nickel carbonate from lateritic ore. Nickel carbonate is transported to Sao Paulo, where metallic nickel is produced. The wastes are stockpiled in sedimentation basins around the company. Mainly opaque minerals (maghemite and magnetite) constitute the wastes. The Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) image shows the mill, rejection basins, and the dam. The present work uses AVIRIS images in order to characterize the rejection basins formed by opaque minerals.
Author
Infrared Imagery; Minerals; Spectrum Analysis; Characterization

20020045160 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Estimating Expressed Temperature and Fractional Area of Hot Lava at the Kilauea Vent with AVIRIS Spectral Measurements
Green, Robert O., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 169-180; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche
   Imaging spectroscopy offers a framework based in physics and chemistry for scientific investigation of a wide range of phenomena of interest in the Earth environment. In the scientific discipline of volcanology knowledge of lava temperature and distribution at the surface provides insight into the volcano status and subsurface processes. A remote sensing strategy to measure surface lava temperatures and distribution would support volcanology research. Hot targets such as molten lava emit spectral

radiance as a function of temperature. A figure shows a series of Planck functions calculated radiance spectra for hot targets at different temperatures. A maximum Lambertian solar reflected radiance spectrum is shown as well. While similar in form, each hot target spectrum has a unique spectral shape and is distinct from the solar reflected radiance spectrum. Based on this temperature-dependent signature, imaging spectroscopy provides an innovative approach for the remote-sensing-based measurement of lava temperature. A natural site for investigation of the measurement of lava temperature is the Big Island of Hawaii where molten lava from the Kilauea vent is present at the surface. In the past, Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data sets have been used for the analysis of hot volcanic targets and hot burning fires. The research presented here builds upon and extends this earlier work. The year 2000 Hawaii AVIRIS data set has been analyzed to derive lava temperatures taking into account factors of fractional fill, solar reflected radiance, and atmospheric attenuation of the surface emitted radiance. The measurements, analyses, and current results for this research are presented here.
Derived from text

Imaging Techniques; Lava; Radiance; Remote Sensing; Spectra; Surface Temperature; Infrared Imagery; Earth Observations (From Space); Thermal Analysis

20020045161 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Measuring the Spectral Expression of Carbon Dioxide in the Solar Reflected Spectrum with AVIRIS
Green, Robert O., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 181-192; In English; Also announced as 20020045138; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Carbon dioxide is a low-concentration, but important, component of the Earth's atmosphere. This gas absorbs electromagnetic radiation (EMR) in several regions of the spectrum. Absorption of energy by carbon dioxide adds heat to the atmosphere. In the world today, the burning of fossil fuels and other anthropogenic processes adds carbon dioxide to the atmosphere. Other natural processes in the Earth's system both add and remove carbon dioxide. Overall, measurements of atmospheric carbon dioxide at selected sites around the globe show an increased carbon dioxide concentration in the atmosphere. A figure shows the measured carbon dioxide from Mauna Loa, Hawaii, from 1958 to 2000. Overall, the concentration has increased from 315 to 365 ppm at this site over this period. (There is also a yearly cycle to the concentration that is timed with and hypothesized to be related to the vegetation growing season in the Northern Hemisphere.) The overall expected effect of this increase of atmospheric carbon dioxide is trapping of heat in the atmosphere and global warming. While this overall relationship between carbon dioxide and global warming seems straightforward, many of the specific details relating to regional and local sources and sinks and gradients of carbon dioxide are not well understood. A remote sensing capability to measure carbon dioxide could provide important inputs for scientific research to better understand the distribution and change in atmospheric carbon dioxide at detailed spatial and temporal levels. In pursuit of this remote sensing of carbon dioxide objective, this paper analyzes the expression of carbon dioxide in the spectral range measured by the Airborne Visible/Infrared Imagery Spectrometer (AVIRIS). Based on these analyses, a spectral-fitting algorithm that uses AVIRIS measured spectra and MODTRAN radiative-transfer code modeled spectra to derive total column carbon dioxide abundance has been developed. This algorithm has been applied to an AVIRIS data set acquired over Pasadena, California, in 1999 and a data set acquired over the Pacific Ocean near Hawaii in 2000 with promising results. This is ongoing research; the current initial analyses, measurements, and results are reported in this paper.
Author

Algorithms; Carbon Dioxide Concentration; Earth Atmosphere; Remote Sensing; Earth Observations (From Space)

20020045167 Analytical Imaging and Geophysics, LLC, Boulder, CO USA
Geologic Validation of EO-1 Hyperion using AVIRIS *Progress Report*
Kruse, F. A., Analytical Imaging and Geophysics, LLC, USA; Boardman, J. W., Analytical Imaging and Geophysics, LLC, USA; Huntington, J. H., Commonwealth Scientific and Industrial Research Organization, Australia; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 253-265; In English; Also announced as 20020045138; Original contains color illustrations
Contract(s)/Grant(s): NCC5-495; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Over the last few years, the field of imaging spectrometry has grown rapidly as new instruments and analysis techniques have been developed. The launch of Hyperion as part of NASA's EO-1 program represents a significant landmark in the progression of the technology; the first spaceborne imaging spectrometry system. AIG, in cooperation with CSIRO, is evaluating, validating, and demonstrating use of EO-1 Hyperion hyperspectral data for geologic applications. The Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) plays a pivotal role in this effort. This manuscript describes the geologic test sites being used and progress

on preparing 'ground truth' for anticipated Hyperion data collects using AVIRIS data. Preliminary findings are extrapolated to predict the effect of instrument characteristics and performance on geologic mapping using Hyperion.
Author
Airborne Equipment; Imaging Spectrometers; Imaging Techniques; Spectroscopy; Earth Observations (From Space); Remote Sensing

20020045216 Aerospace Corp., Lab Operations, El Segundo, CA USA
New Cirrus Models for MODTRAN4. I: Models Derived from the Standard and Subvisual Models
Mazuk, Steve; Lynch, David K.; Feb. 28, 2002; 29p; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A400673; TR-2002(8570)-5; SMC-TR-02-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    The purpose of this report is to set forth a new set of cirrus cloud models for use with the MODTRAN4 atmospheric transmission model and to provide a wider range of cirrus models with which to investigate future remote sensing techniques that may have to observe through cirrus. The cirrus cloud models were derived by selecting mode particle sizes between and beyond the two existing cirrus cloud models in MODTRAN4: Standard (mode particle radius 64 micrometers) and subvisual (mode 4 micrometers). The new set of models consists of 70 models whose mode particle radius range between 0.1 and 64 micrometers. The format of the models meets the input requirements for MODTRAN4 and consist of files containing the input information on card 2E2. All the model calculations are based on spherical particles.
DTIC
Cirrus Clouds; Remote Sensing; Applications Programs (Computers); Atmospheric Models

20020045312 NASA Marshall Space Flight Center, Huntsville, AL USA
Near-simultaneous Polar and DMSP Measurements of Topside Ionospheric Field-Aligned Flows at High Latitudes
Zeng, W., Alabama Univ., USA; Horwitz, J. L., Alabama Univ., USA; Stevenson, B. A., Alabama Univ., USA; Wu, X.-Y., Alabama Univ., USA; Su, Y.-J., Los Alamos National Lab., USA; Craven, P. D., NASA Marshall Space Flight Center, USA; Rich, F. J., Air Force Research Lab., USA; Moore, T. E., NASA Goddard Space Flight Center, USA; Tu, J.-N., Alabama Univ., USA; Journal of Geophysical Research; Dec. 01, 2001; ISSN 0148-0227; Volume 106, No. A12, pp. 29,601-29,610; In English
Contract(s)/Grant(s): NCC8-65; NSF ATM-93-01024; NSF ATM-96-12573; RTOP 370-17-43
Report No.(s): Paper-2000JA000332; Copyright; Avail: Issuing Activity
    Near-simultaneous observations of topside O(+) parallel flows are presented for four periods of measurement by the Polar and DMSP satellites during April 1996. The Polar measurements were from southern perigee measurements near 5000 km altitude, while the DMSP measurements were from 840 km altitude. In general, the velocities were upward at expected cleft and auroral latitudes, typically about 2-10 km per second at 5000 km altitude, and 0-2 km per second at 840 km altitude. At the highest, polar cap latitudes, downward velocities were more frequent at both altitudes, but especially at the lower 840 km altitude. The downward velocities were typically a few hundred meters per second at 840 km altitude, and 0-1 km per second at 5000 km altitude. In some instances, downward velocities were observed at 840 km altitude while upward O(+) flows were observed at 5000 km altitude, possibly on the same flux tube. The O(+) densities were characteristically 10(exp 3) - 10(exp 4) O(+) at 5000 km altitude and 10(exp 3) - 10(exp 4) O(+) cm (exp -3) at 840 km altitude, while the O(+) fluxes were characteristically 10(exp 5) - 10(exp 7) O(+) cm(exp -2) per second at 5000 km altitude and characteristically 10(exp 7) - 10(exp 9) O(+) cm(exp -2) per second at 840 km altitude. We have also examined the dual-altitude parameter measurements for a polar cap field line, the Polar and DMSP measurements approximately 30 min apart, and compared them with results from a transport simulation. The simulated high-altitude velocity altitude profiles for the period during and after the initiation of the auroral processes generally bracketed the observations, but the observed downward velocities (500 - 600 m per second) at 840 km altitude were much larger in magnitude than those observed at both altitudes.
Author
Auroral Zones; DMSP Satellites; Polar Regions; Earth Ionosphere; Flow Velocity; Latitude

20020045324 Lebedev Physical Inst., Moscow, Russia
Studies of Plasma Instability Processes Excited by Ground Based High Power HF (Heating) Facilities *Final Report*
Gurevich, Aleksander; Mar. 03, 2000; 13p; In English
Contract(s)/Grant(s): F61775-99-WE026; SPC-99-4026
Report No.(s): AD-A400682; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking P. N. Lebedev Physical Institute as follows: The contractor will investigate electron acceleration mechanisms. He will quantitatively compare his theoretical calculations to existing data from HF heating facilities at Arecibo, Puerto Rico, and, if possible, from SURA, near Nizhny Novgorod, Russia.
DTIC
Acceleration (Physics); Heating; Magnetohydrodynamic Stability; High Frequencies

20020045357 California Univ., Inst. of Geophysics and Planetary Physics, Los Angeles, CA USA

Currents and Flows in Distant Magnetospheres

Kivelson, Margaret Galland, California Univ., USA; Magnetospheric Current Systems; [2000], pp. 339-352; In English

Contract(s)/Grant(s): JPL-958694; NAG5-7959

Report No.(s): Geophysical-Monograph-118; Copyright; Avail: Issuing Activity

Space scientists have explored, described, and explained the terrestrial magnetosphere for four decades. Rarely do they point out that the planetary and solar wind parameters controlling the size, shape, and activity of Earth's magnetosphere map out only a small portion of the space of dimensionless parameters that govern magnetospheric properties. With the discovery of Ganymede's magnetosphere, the range of parameters relevant to magnetospheric studies has grown by orders of magnitude. Consider the extremes of Ganymede's and Jupiter's magnetospheres. Jupiter's magnetosphere forms within a plasma flowing at super-Alfvenic speed, whereas Ganymede's forms in a sub-Alfvenic flow. The scale sizes of these magnetospheres, characterized by distances to the magnetopause of order 7x10(exp 6) km and 5x10(exp 3) km, respectively, differ by three orders of magnitude, ranging from 100 to 0.1 times the scale of Earth's magnetosphere. The current systems that control the structure and dynamics of a magnetosphere depend on specific plasma and field properties. Magnetopause currents at Ganymede differ greatly from the forms familiar for Earth and Jupiter, principally because the Mach number of the ambient plasma flow greatly influences the shape of the magnetosphere. A magnetodisk current, present at Jupiter because of its rapid rotation, is absent at Earth and Ganymede. The ring current, extensively investigated at Earth, is probably unimportant at Ganymede because the dynamical variations of the external flow are slow. The ring current is subsumed within the magnetodisk current at Jupiter. This paper describes and contrasts aspects of these and other current systems for the three bodies.
Author
Earth Magnetosphere; Ganymede; Ring Currents; Magnetohydrodynamic Waves; Geophysics

20020045524 Massachusetts Inst. of Tech., Dept. of Earth, Atmospheric and Planetary Sciences, Cambridge, MA USA

Carbonate Platform Development and Stromatolite Morphogenesis: Constraints on Environmental and Biological Evolution *Progress Report, 1 May 2001 - 30 Apr. 2002*

Grotzinger, John P., Massachusetts Inst. of Tech., USA; [2002]; 4p; In English

Contract(s)/Grant(s): NAG5-9445; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Work this past year has focused on the globally significant events of faunal turnover, tectonic reorganization, and biogeochemical change that closely coincided with the Precambrian-Cambrian boundary in the Sultanate oilman. Higher temporal and chronostratigraphic resolution are required in order to answer this question. Stratigraphic sections must contain fossils, volcanic rocks, and abundant carbonates with little or no diagenetic overprint. The Ara Group of the South Oman Salt Basin presents such a succession - with carbonate rocks tightly enclosed in a protective envelope of impermeable halite, these rocks have likely never exchanged with younger fluids. Our work has had two thrusts. The first pertains to the geochemistry of the Athel Formation, a deep water deposit formed at the Precambrian-Cambrian boundary which contains unique records of ocean anoxia for that time interval. This unit is important because it will enable tighter focus on the links which existed between global biogeochemical events and episodes of faunal extinction and radiation. The second direction involves a comparison of terminal Proterozoic thrombolites between Oman (subsurface) and Namibia (outcrop). These thrombolites are important not only as significant deposits of ancient microbial communities, but because they formed the key substrate for growth of the oldest calcified metazoans - Cloudina and Namacalathus.
Author
Biogeochemistry; Biological Evolution; Carbonates; Stratigraphy; Geomorphology

Includes weather observation forecasting and modification

20020044499 Naval Pacific Meteorology and Oceanography Center/Joint Typhoon Warning Center, Pearl Harbor, HI USA
1976 Annual Typhoon Report *Annual Report, 1976*
Mortford, Dean R.; Pilipowskyj, Serhij; Jan. 1995; 97p; In English
Report No.(s): AD-A400213; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

   The Annual Typhoon Report summarizes the tropical cyclones occurring during 1976 in the western North Pacific, the Central North Pacific and the North Indian Oceans. The USA National Weather Service publishes summaries of eastern North Pacific tropical cyclones in the Mariners Weather Log, and Pilot Charts.
DTIC
Typhoons; Meteorological Services; Tropical Storms; Cyclones

20020044746 Massachusetts Inst. of Tech., MA USA
Reconnaissance of Near-Earth Objects *Final Report*
Binzel, Richard P., Massachusetts Inst. of Tech., USA; [2002]; 8p; In English
Contract(s)/Grant(s): NAG5-3939; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   NASA sponsorship of asteroid research for this grant has resulted in 30 publications and major new results relating near-Earth asteroids to known meteorite groups, most especially ordinary chondrites. Analysis of observations continues.
Author
Asteroids; Chondrites; Near Earth Objects; Characterization

20020045214 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of the Meteorological Satellite Center: January 2002
January 2002; In English; CD-ROM conforms to the ISO 9660 standard for volume and file structure; Copyright; Avail: Issuing Activity

   The CD-ROM concerning the January 2002 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20020045387 Scripps Institution of Oceanography, La Jolla, CA USA
Seasonal to Decadal-Scale Variability in Satellite Ocean Color and Sea Surface Temperature for the California Current System *Final Report, 1 Nov. 1997 - 30 Apr. 2001*
Mitchell, B. Greg, Scripps Institution of Oceanography, USA; Kahru, Mati, Scripps Institution of Oceanography, USA; May 01, 2002; 8p; In English
Contract(s)/Grant(s): NAG5-10276
Report No.(s): Rept-21-1165; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   Support for this project was used to develop satellite ocean color and temperature indices (SOCTI) for the California Current System (CCS) using the historic record of CZCS West Coast Time Series (WCTS), OCTS, WiFS and AVHRR SST. The ocean color satellite data have been evaluated in relation to CalCOFI data sets for chlorophyll (CZCS) and ocean spectral reflectance and chlorophyll OCTS and SeaWiFS. New algorithms for the three missions have been implemented based on in-water algorithm data sets, or in the case of CZCS, by comparing retrieved pigments with ship-based observations. New algorithms for absorption coefficients, diffuse attenuation coefficients and primary production have also been evaluated. Satellite retrievals are being evaluated based on our large data set of pigments and optics from CalCOFI.
Author
Algorithms; Attenuation Coefficients; Coastal Zone Color Scanner; Ocean Currents; Pigments; Sea-Viewing Wide Field-Of-View Sensor; Time Series Analysis; Water Color

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20020044096 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Volume 1

Mueller, James L., Editor, San Diego State Univ., USA; Fargion, Giulietta, Editor, Science Applications International Corp., USA; Mueller, J. L., San Diego State Univ., USA; Trees, C., San Diego State Univ., USA; Austin, R. W., San Diego State Univ., USA; Pietras, C., Science Applications International Corp., USA; Hooker, S., NASA Goddard Space Flight Center, USA; Holben, B., NASA Goddard Space Flight Center, USA; McClain, Charles R., NASA Goddard Space Flight Center, USA; Clark, D. K., National Oceanic and Atmospheric Administration, USA; Yuen, M., National Oceanic and Atmospheric Administration, USA; February 2002; 146p; In English

Report No.(s): NASA/TM-2002-210004/VOL1-REV3; Rept-2002-01118-0/VOL1-REV3; NAS 1.15:210004/VOL1-REV3; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

    This document stipulates protocols for measuring bio-optical and radiometric data for the SIMBIOS Project. It supersedes the earlier version, and is organized into four parts: Introductory Background, Instrument Characteristics, Field Measurements and Data Analysis, Data Reporting and Archival. Changes in this revision include the addition of three new chapters: (1) Fundamental Definitions, Relationships and Conventions; (2) MOBY, A Radiometric Buoy for Performance Monitoring and Vicarious Calibration of Satellite Ocean Color Sensors: Measurement and Data Analysis Protocols; and (3) Normalized Water-Leaving Radiance and Remote Sensing Reflectance: Bidirectional Reflectance and Other Factors. Although the present document represents another significant, incremental improvement in the ocean optics protocols, there are several protocols that have either been overtaken by recent technological progress, or have been otherwise identified as inadequate. Revision 4 is scheduled for completion sometime in 2003. This technical report is not meant as a substitute for scientific literature. Instead, it will provide a ready and responsive vehicle for the multitude of technical reports issued by an operational Project. The contributions are published as submitted, after only minor editing to correct obvious grammatical or clerical errors.

Author

Remote Sensing; Water Color; Standards; Satellite Observation

20020044098 NASA Goddard Space Flight Center, Greenbelt, MD USA

SIMBIOS Project *Annual Report, 2001*

Fargion, Giulietta S., Science Applications International Corp., USA; McClain, Charles R., NASA Goddard Space Flight Center, USA; March 2002; 194p; In English

Report No.(s): NASA/TM-2002-210005; Rept-2002-01288-1; NAS 1.15:210005; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

    The purpose of this technical report is to provide current documentation of the Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) Project activities, NASA Research Announcement (NRA) research status, satellite data processing, data product validation, and field calibration. This documentation is necessary to ensure that critical information is related to the scientific community and NASA management. This critical information includes the technical difficulties and challenges of validating and combining ocean color data from an array of independent satellite systems to form consistent and accurate global bio-optical time series products. This technical report is not meant as a substitute for scientific literature. Instead, it will provide a ready and responsive vehicle for the multitude of technical reports issued by an operational project. The SIMBIOS Science Team Principal Investigators' (PIs) original contributions to this report are in chapters four and above. The purpose of these contributions is to describe the current research status of the SIMBIOS-NRA-96 funded research. The contributions are published as submitted, with the exception of minor edits to correct obvious grammatical or clerical errors.

Author

Marine Biology; Oceanography; Remote Sensing; Satellite Observation

20020044099 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Volume 2

Mueller, James L., Editor, San Diego State Univ., USA; Fargion, Giulietta S., Editor, Science Applications International Corp., USA; Trees, C., San Diego State Univ., USA; Austin, R. W., San Diego State Univ., USA; Pietras, C., Editor, Science Applications International Corp., USA; Hooker, S., NASA Goddard Space Flight Center, USA; Holben, B., NASA Goddard Space Flight Center, USA; McClain, Charles R., NASA Goddard Space Flight Center, USA; Clark, D. K., National Oceanic and Atmospheric

Administration, USA; Yuen, M., National Oceanic and Atmospheric Administration, USA; February 2002; 180p; In English
Report No.(s): NASA/TM-2002-210004/VOL2-REV3; Rept-2002-01118-0/VOL2-REV3; NAS 1.15:210004/VOL2-REV3; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This document stipulates protocols for measuring bio-optical and radiometric data for the SIMBIOS Project. It supersedes the earlier version, and is organized into four parts: Introductory Background, Instrument Characteristics, Field Measurements and Data Analysis, Data Reporting and Archival. Changes in this revision include the addition of three new chapters: (1) Fundamental Definitions, Relationships and Conventions; (2) MOBY, A Radiometric Buoy for Performance Monitoring and Vicarious Calibration of Satellite Ocean Color Sensors: Measurement and Data Analysis Protocols; and (3) Normalized Water-Leaving Radiance and Remote Sensing Reflectance: Bidirectional Reflectance and Other Factors. Although the present document represents another significant, incremental improvement in the ocean optics protocols, there are several protocols that have either been overtaken by recent technological progress, or have been otherwise identified as inadequate. Revision 4 is scheduled for completion sometime in 2003. This technical report is not meant as a substitute for scientific literature. Instead, it will provide a ready and responsive vehicle for the multitude of technical reports issued by an operational Project. The contributions are published as submitted, after only minor editing to correct obvious grammatical or clerical errors.
Author
Remote Sensing; Standards; Oceans

20020044133 NASA Goddard Space Flight Center, Greenbelt, MD USA
Science and Observation Recommendations for Future NASA Carbon Cycle Research
McClain, Charles R., NASA Goddard Space Flight Center, USA; Collatz, G. J., NASA Goddard Space Flight Center, USA; Kawa, S. R., NASA Goddard Space Flight Center, USA; Gregg, W. W., NASA Goddard Space Flight Center, USA; Gervin, J. C., NASA Goddard Space Flight Center, USA; Abshire, J. B., NASA Goddard Space Flight Center, USA; Andrews, A. E., NASA Goddard Space Flight Center, USA; Behrenfeld, M. J., NASA Goddard Space Flight Center, USA; Demaio, L. D., NASA Goddard Space Flight Center, USA; Knox, R. G., NASA Goddard Space Flight Center, USA; April 2002; 182p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2002-210009; Rept-000136; NAS 1.15:210009; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Between October 2000 and June 2001, an Agency-wide planning, effort was organized by elements of NASA Goddard Space Flight Center (GSFC) to define future research and technology development activities. This planning effort was conducted at the request of the Associate Administrator of the Office of Earth Science (Code Y), Dr. Ghassem Asrar, at NASA Headquarters (HQ). The primary points of contact were Dr. Mary Cleave, Deputy Associate Administrator for Advanced Planning at NASA HQ (Headquarters) and Dr. Charles McClain of the Office of Global Carbon Studies (Code 970.2) at GSFC. During this period, GSFC hosted three workshops to define the science requirements and objectives, the observational and modeling requirements to meet the science objectives, the technology development requirements, and a cost plan for both the science program and new flight projects that will be needed for new observations beyond the present or currently planned. The plan definition process was very intensive as HQ required the final presentation package by mid-June 2001. This deadline was met and the recommendations were ultimately refined and folded into a broader program plan, which also included climate modeling, aerosol observations, and science computing technology development, for contributing to the President's Climate Change Research Initiative. This technical memorandum outlines the process and recommendations made for cross-cutting carbon cycle research as presented in June. A separate NASA document outlines the budget profiles or cost analyses conducted as part of the planning effort.
Author
Carbon Cycle; Climate Models; Aerosols

20020044134 NASA Goddard Space Flight Center, Greenbelt, MD USA
Sensitivity of Global Sea-Air CO2 Flux to Gas Transfer Algorithms, Climatological Wind Speeds, and Variability of Sea Surface Temperature and Salinity
McClain, Charles R., NASA Goddard Space Flight Center, USA; Signorini, Sergio, Science Applications International Corp., USA; April 2002; 34p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2002-211604; Rept-2002-01624-1; NAS 1.15:211604; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Sensitivity analyses of sea-air CO2 flux to gas transfer algorithms, climatological wind speeds, sea surface temperatures (SST) and salinity (SSS) were conducted for the global oceans and selected regional domains. Large uncertainties in the global sea-air flux estimates are identified due to different gas transfer algorithms, global climatological wind speeds, and seasonal SST and SSS data. The global sea-air flux ranges from -0.57 to -2.27 Gt/yr, depending on the combination of gas transfer algorithms

and global climatological wind speeds used. Different combinations of SST and SSS global fields resulted in changes as large as 35% on the oceans global sea-air flux. An error as small as plus or minus 0.2 in SSS translates into a plus or minus 43% deviation on the mean global CO_2 flux. This result emphasizes the need for highly accurate satellite SSS observations for the development of remote sensing sea-air flux algorithms.

Author

Algorithms; Carbon Dioxide; Climatology; Salinity; Sea Surface Temperature; Wind Velocity; Oceanography; Gases

20020045158 XonTech, Inc., Van Nuys, CA USA

Oceanographic and Atmospheric Retrievals from AVIRIS Hyperspectral Data

Gelpi, Craig, XonTech, Inc., USA; Schuraytz, Benjamin C., XonTech, Inc., USA; Husman, Matthew E., XonTech, Inc., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 151-159; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

  The ocean and coastal zone are particularly challenging environments for using high-altitude, hyperspectral data. to discern ocean characteristics, atmospheric effects must be compensated for; not only does absorption by atmospheric gases affect a large portion of the reflective spectrum, but atmospheric path scattering contributes a much greater percentage of the measured radiance than that which emanates from the surface and water column. Additionally, the water surface has a strong bi-reflectance distribution function (BRDF) that changes as a function of wind and wave conditions. These effects, too, must be compensated for to make full use of hyperspectral signatures of water column and surface phenomena, an area rich in potential for hyperspectral applications. We are developing hyperspectral techniques to perform these compensations for over-ocean analysis. One method, the Modulated Surface Reflectance (MSR) algorithm, employs scale-size differences between atmospheric variations and the modulated radiance produced by surface waves to remove atmospheric path-scattered radiance. The modulated-radiance spectrum is used directly to compute water-vapor column density, which is required to compensate for water-vapor absorption. In the present work, we continue to exploit the modulated radiance by developing techniques that relate its amplitude to the surface waveheight by accounting for atmospheric and surface effects. Although waveheight is a desired quantity in its own right, these techniques promise to be especially useful for the analysis of hyperspectral data gathered from satellites, where sea and atmospheric conditions are expected to be inhomogeneous across the image.

Derived from text

Algorithms; Distribution Functions; Oceanography; Surface Water; Atmospheric Effects; Imaging Techniques

20020045159 California Univ., Center for Spatial Technologies and Remote Sensing, Davis, CA USA

Hyperspectral Image Analysis of Coral Reefs in the Hawaiian Islands

Goodman, James A., California Univ., USA; Ustin, Susan L., California Univ., USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 161-168; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

  Concern over the health of coral reef communities has greatly intensified in recent years, particularly with regard to the complex dynamics of global change. The synoptic spatial and temporal monitoring capabilities of remote sensing provide a valuable avenue for evaluating the impacts of local, regional, and global change on this important natural resource. Hyperspectral imagery acquired over the Hawaiian Islands in the spring of 2000 by NASA's Airborne Visible Infrared Imaging Spectrometer (AVIRIS) will be used to develop, apply, and evaluate algorithms for analyzing coral reefs using remote sensing data. In order to truly leverage the synoptic capabilities of remote sensing, algorithms developed in this research will be based on fundamental scientific principals that will allow methods to be used in diverse geographic locations. Primary algorithm development will be conducted in Kaneohe Bay, Oahu due to the extensive supporting resources available for evaluating algorithm accuracy. An essential element of any program to preserve, protect, and manage coral reefs is to identify a reliable means for quantitatively mapping and assessing the dynamics of community distribution, identifying stressor-response relationships, incorporating multiple levels of spatial analysis and efficiently monitoring the current and future health of the ecosystem. The ability to address such issues using remote sensing is made possible by recent advances in detector technologies, the acquisition of coral-specific spectral information, increases in the spatial and spectral resolution of sensors, as well as by improved computer capabilities and analysis methods. This research project will develop a set of analysis tools using the latest advances in hyperspectral remote sensing. Hyperspectral technology provides improved spectral resolution over more traditional remote sensing methods, and thus translates to greater usefulness in being able to distinguish between the varying spectral characteristics of different benthic habitat types. Specific objectives of the overall research project are: (1) to develop algorithms for bathymetry and benthic habitat mapping; (2) create tools for the identification of large-scale coral community composition; and (3) to examine causal relationships associated with environmental stress and global change. Presented here are results from the first phase of this analysis

examining spectral separability of different species and different habitat types in Kaneohe Bay using both field spectra and imagery.
Derived from text
Algorithms; Coral Reefs; Image Analysis; Infrared Imagery; Remote Sensing; Earth Observations (From Space)

20020045342 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Seventh SeaWiFS Intercalibration Round-Robin Experiment (SIRREX-7), March 1999

Hooker, Stanford B., Editor, NASA Goddard Space Flight Center, USA; Firestone, Elaine R., Editor, Science Applications International Corp., USA; McLean, Scott, Satlantic, Inc., Canada; Sherman, Jennifer, Satlantic, Inc., Canada; Small, Mark, Satlantic, Inc., Canada; Lazin, Gordana, Satlantic, Inc., Canada; Zibordi, Giuseppe, Joint Research Centre of the European Communities, Italy; Brown, James W., Miami Univ., USA; February 2002; ISSN 1522-8789; 78p; In English

Report No.(s): NASA/TM-2002-206892/VOL17; Rept-2002-01240-0/VOL17; NAS 1.15:206892/VOL17; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report documents the scientific activities during the seventh SeaWiFS Intercalibration Round-Robin Experiment (SIRREX-7) held at Satlantic, Inc. (Halifax, Canada). The overall objective of SIRREX-7 was to determine the uncertainties of radiometric calibrations and measurements at a single calibration facility. Specifically, this involved the estimation of the uncertainties in a) lamp standards, b) plaque standards (including the uncertainties associated with plaque illumination non-uniformity), c) radiance calibrations, and d) irradiance calibrations. The investigation of the uncertainties in lamp standards included a comparison between a calibration of a new FEL by the National Institute of Standards and Technology (NIST) and Optronic Laboratories, Inc. In addition, the rotation and polarization sensitivity of radiometers were determined, and a procedure for transferring an absolute calibration to portable light sources was defined and executed.
Author
Intercalibration; Radiometers; Sea-Viewing Wide Field-Of-View Sensor; Radiance

20020045345 NASA Goddard Space Flight Center, Greenbelt, MD USA

The First SIMBIOS Radiometric Intercomparison (SIMRIC-1), April-September 2001

Meister, Gerhard, FutureTech Corp., USA; Abel, Peter, NASA Goddard Space Flight Center, USA; McClain, Charles, NASA Goddard Space Flight Center, USA; Barnes, Robert, Science Applications International Corp., USA; Fargion, Giulietta, Science Applications International Corp., USA; Cooper, John, Raytheon Information Technology and Scientific Services, USA; Davis, Curtiss, Naval Research Lab., USA; Korwan, Daniel, Naval Research Lab., USA; Godin, Mike, HOBI Labs., USA; Maffione, Robert, HOBI Labs., USA; March 2002; 70p; In English

Report No.(s): NASA/TM-2002-210006; Rept-2002-01353-0; NAS 1.15:210006; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the first SIMBIOS (Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies) Radiometric Intercomparison (SIMRIC-1). The purpose of the SIMRIC-1 is to ensure a common radiometric scale of the calibration facilities that are engaged in calibrating in situ radiometers used for ocean color related research and to document the calibration procedures and protocols. SIMBIOS staff visited the seven participating laboratories for at least two days each. The SeaWiFS Transfer Radiometer SXR-II measured the calibration radiances produced in the laboratories. The measured radiances were compared with the radiances expected by the laboratories. Typically, the measured radiances were higher than the expected radiances by 0 to 2%. This level of agreement is satisfactory. Several issues were identified, where the calibration protocols need to be improved, especially the reflectance calibration of the reference plaques and the distance correction when using the irradiance standards at distances greater than the 50 cm. The responsivity of the SXR-II changed between 0.3% (channel 6) and 1.6% (channel 2) from December 2000 to December 2001. Monitoring the SXR-II with a portable light source showed a linear drift of the calibration, except for channel 1, where a 2% drop occurred in summer.
Author
Radiometers; Sensors; Oceanography; Reflectance; Radiance

20020045350 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA

SeaSoar Spectral Light Absorption and Attenuation Observations During the Coastal Mixing and Optics Experiment: R/V Endeavor Cruises from 14 August to 1 September 1996 and 25 April to 15 May 1997

Simeon, J.; Barth, J. A.; Bogucki, D. J.; Erofeev, A.; Pierce, S. D.; Jun. 2000; 233p; In English

Report No.(s): AD-A400439; OSU-DR-179; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This data report includes documentation of the Coastal Mixing and Optics (CMO) Experiment inherent optical property surveys on the continental shelf and slope in the Mid-Atlantic Bight south of Cape Cod, Massachusetts, USA. The surveys were

conducted aboard the R/V Endeavor during two physical oceanography cruises: E9608 (14 August to 1 September 1996) and E9704 (25 April to 15 May 1997). The objective of the CMO Experiment was to rapidly survey a region in the Mid-Atlantic Bight (centered around 40.5 N, 70.5 W) to obtain three-dimensional, high-resolution measurements which would allow further elucidation of the length scales, distributions and relationships between hydrographic and optical properties. This report describes the installation and deployment of the optical instrumentation as well as the data acquisition, data processing and editing of the inherent optical property data. Vertical sections and maps of the inherent optical properties obtained from the surveys are also presented.

DTIC

Ocean Data Acquisitions Systems; Ocean Dynamics; Optical Properties; Surveys

20020045386 NASA Goddard Space Flight Center, Greenbelt, MD USA

Navigation Algorithms for the SeaWiFS Mission

Hooker, Stanford B., Editor, NASA Goddard Space Flight Center, USA; Firestone, Elaine R., Editor, Science Applications International Corp., USA; Patt, Frederick S., Science Applications International Corp., USA; February 2002; ISSN 1522-8789; 22p; In English

Report No.(s): NASA/TM-2002-206892/VOL16; Rept-2002-01112-0/VOL16; NAS 1.15:206892/VOL16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The navigation algorithms for the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) were designed to meet the requirement of 1-pixel accuracy-a standard deviation (sigma) of 2. The objective has been to extract the best possible accuracy from the spacecraft telemetry and avoid the need for costly manual renavigation or geometric rectification. The requirement is addressed by postprocessing of both the Global Positioning System (GPS) receiver and Attitude Control System (ACS) data in the spacecraft telemetry stream. The navigation algorithms described are separated into four areas: orbit processing, attitude sensor processing, attitude determination, and final navigation processing. There has been substantial modification during the mission of the attitude determination and attitude sensor processing algorithms. For the former, the basic approach was completely changed during the first year of the mission, from a single-frame deterministic method to a Kalman smoother. This was done for several reasons: a) to improve the overall accuracy of the attitude determination, particularly near the sub-solar point; b) to reduce discontinuities; c) to support the single-ACS-string spacecraft operation that was started after the first mission year, which causes gaps in attitude sensor coverage; and d) to handle data quality problems (which became evident after launch) in the direct-broadcast data. The changes to the attitude sensor processing algorithms primarily involved the development of a model for the Earth horizon height, also needed for single-string operation; the incorporation of improved sensor calibration data; and improved data quality checking and smoothing to handle the data quality issues. The attitude sensor alignments have also been revised multiple times, generally in conjunction with the other changes. The orbit and final navigation processing algorithms have remained largely unchanged during the mission, aside from refinements to data quality checking. Although further improvements are certainly possible, future evolution of the algorithms is expected to be limited to refinements of the methods presented here, and no substantial changes are anticipated.

Author

Algorithms; Navigation; Sea-Viewing Wide Field-Of-View Sensor; Telemetry; Mathematical Models

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20020044115 Manitoba Univ., Winnipeg, Manitoba Canada

Resources for Precision Analysis of Human Breast Cancer *Annual Report, 15 Jul. 2000-15 Jul 2001*

Watson, Peter H.; Aug. 2001; 104p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9272

Report No.(s): AD-A400457; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

   This US Army academic award guarantees ongoing protection and a balance of 75/25% of the author's time for research/clinical activities. This ensures his continued active contribution to breast cancer research through specific projects underway in his laboratory as well as through efforts to maintain and improve on resources that offer appropriately processed, relevant and pathologically defined tissue samples to other investigators. This award has allowed the PI to 1) continue to advance

research projects that are currently ongoing in the laboratory focusing on the role of the psoriasin and lumican genes, the identification and study of additional novel genes associated with progression of pre-invasive DCIS to invasive disease, and 2) continue to direct the NCIC-Manitoba Breast Tumor Bank and offer clinical pathology expertise and advice to many investigators who seek access to appropriate tissues to test their ideas in conjunction with tissues associated with NCIC-clinical trial datasets, and tissues comprising pre-neoplastic and pre-invasive lesions.
DTIC
Cancer; Mammary Glands; Tumors

20020044116 Georgetown Univ., Medical Center, Washington, DC USA
Breast Cancer Metastasis and the Balance of the Serine Protease Matriptase and Its Inhibitor KSPI-1 *Annual Report, 1 Jul. 2000-30 Jun. 2001*
Johnson, Michael D.; Jul. 2001; 13p; In English
Contract(s)/Grant(s): DAMD17-00-1-0264
Report No.(s): AD-A400456; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    This study set out to evaluate the biological consequences of a shift in the ratio of the serine protease matriptase relative to its cognate inhibitor HAI-1. The goal of this work is to generate data that we believe will assist in evaluating whether the matriptase HAI-1 system plays a role in breast cancer invasion and metastasis. In order to alter protease/inhibitor ratios we proposed to use a tetracycline regulable expression system to either increase matriptase levels by overexpression or reduce HAI-1 levels by expression of a ribozyme targeted to the HAI-1 mRNA. Although we have encountered significant technical difficulties with this project, we have made considerable progress. Having obtained a full length cDNA clone of matriptase we generated cell lines that over express the gene in an inducible fashion and have started to evaluate the biological consequences of such overexpression. Thus far we have found that such overexpression has no effect on cell proliferation or on the synthesis or activation of two matrix metallo proteases - MMP-2 and MMP-9. Work is rapidly proceeding on the remaining studies.
DTIC
Metastasis; Cancer; Protease; Mammary Glands; Peptides

20020044117 House Ear Inst., Los Angeles, CA USA
Establish an in vitro Model fo rthe Study of NF2 Gene Function and Gene Therapy *Annual Report, 1 Oct. 2000-30 Sep. 2001*
Hung, Gene; Oct. 2001; 11p; In English
Contract(s)/Grant(s): DAMD17-99-1-9491
Report No.(s): AD-A400467; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Mutation analyses of the NF2 gene from NF2 patients suggest that the inactivation of the NF2 gene, and the consequent lack of gene product (protein known as Merlin/Schwannomin) is the primary cause of this disease. Within the three years period, we plan to develop a laboratory protocol to establish Schwann cell culture using surgical specimens from NF2 patients, and compare the tumor cells from patients with different NF2 gene mutations. In addition, we want to extend the life span of primary culture cells by immortalizing them using a retrovirus which we engineered. This will not only ensure the reproducibility of results within the NF2 community, but also provide scientists greater access to certain materials for the study of biologic function of Schwann cell and also important for testing therapeutic approaches. During the first 12 months, an additional 4 normal Schwann cells cultures were added to the previously banked cultures. One addition of primary human vestibular schwannoma culture from a NF2 patients and one normal Schwann cell culture are in the process of immortalization.
DTIC
Gene Therapy; Genes; In Vitro Methods and Tests; Vestibules

20020044118 Wake Forest Coll., School of Medicine, Winston-Salem, NC USA
Tropomyosin-1: A Putative Tumor-Suppressor and a Biomarker of Human Breast Cancer *Annual Report, 1 Oct. 2000-30 Sep. 2001*
Prasad, Gaddamanugu L.; Oct. 2001; 57p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8162
Report No.(s): AD-A400464; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
    Changes in the expression of microfilament-associated proteins such as tropomyosins, are associated with the transformed phenotype. In this work we have tested the hypothesis that TM1 is putative biomarker and tumor suppressor of breast cancer. Using TM1-specific antibodies RNA probes, we are assessing the expression of TM1 in the primary breast tumor specimens. Restoration of TM1 expression in MCF-7 (MCF-7/T) cells resulted in slower growth rate. MCF-7/T cells remain sensitive to growth control

by estrogen, and TM1 re-expression appears to strengthen the interaction of E-cadherin-catenin complex with microfilaments. More significantly, MCF-7/T cells failed to grow under anchorage-independent conditions. Thus, TM1 appears to be essential for normal growth and differentiation of mammary epithelium. Abolition of TM1 expression appears to be necessary for malignant transformation by multiple oncogenic modalities. Together, our findings demonstrate that TM1 is a class II tumor suppressor.

DTIC

Epithelium; Cancer; Estrogens; Antibodies; Biomarkers

20020044506 Department of Labor, Occupational Safety and Health Administration, Washington, DC USA

Bloodborne Pathogens and Acute Care Facilities

Jan. 1992; 22p; In English; Original contains color images

Report No.(s): AD-A400184; OSHA-3128; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

According to Occupational Safety and Health Administration (OSHA) estimates, more than 5.6 million workers in health care and related occupations are at risk of exposure to bloodborne pathogens, such as the human immunodeficiency (HIV) and hepatitis B (HBV) viruses, and other potentially infectious materials. of these health care workers, approximately 3 million comprise hospitals, physicians' offices, and government clinics.

DTIC

Blood; Occupational Diseases; Health; Medical Services; Pathogens; Microorganisms

20020044749 Utah State Univ., Dept. of Plants, Soils and Biometeorology, Logan, UT USA

Greenhouse (III): Gas-Exchange and Seed-to-Seed Experiments on the Russian Space Station MIR and Earth-grown, Ethylene-Treated Wheat Plants *Final Report, FY 1999-2001*

Campbell, William F., Utah State Univ., USA; Bingham, Gail, Utah State Univ., USA; Carman, John, Utah State Univ., USA; Bubenheim, David, NASA Ames Research Center, USA; Levinskikh, Margarita, Institute of Biomedical Problems, USSR; Sytchev, Vladimir N., Institute of Biomedical Problems, USSR; Podolsky, Igor B., Institute of Biomedical Problems, USSR; Chernova, Lola, Institute of Biomedical Problems, USSR; Nefodova, Yelena, Institute of Biomedical Problems, USSR; [2001]; 36p; In English

Contract(s)/Grant(s): NCC2-831; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Mir Space Station provided an outstanding opportunity to study long-term plant responses when exposed to a microgravity environment. Furthermore, if plants can be grown to maturity in a microgravity environment, they might be used in future bioregenerative life-support systems (BLSS). The primary objective of the Greenhouse experiment onboard Mir was to grow Super Dwarf and Apogee wheat through complete life cycles in microgravity; i.e., from seed-to-seed-to-seed. Additional objectives were to study chemical, biochemical, and structural changes in plant tissues as well as photosynthesis, respiration, and transpiration (evaporation of water from plants). Another major objective was to evaluate the suitability clothe facilities on Mir for advanced research with plants. The Greenhouse experiment was conducted in the Russian/Bulgarian plant growth chamber, the Svet, to which the USA added instrumentation systems to monitor changes in CO2 and water vapor caused by the plants (with four infrared gas analyzers monitoring air entering and leaving two small plastic chambers). In addition, the US instrumentation also monitored O2; air, leaf (IR), cabin pressure; photon flux; and substrate temperature and substrate moisture (16 probes in the root module). Facility modifications were first performed during the summer of 1995 during Mir 19, which began after STS-72 left Mir. Plant development was monitored by daily observations and some photographs.

Derived from text

Microgravity; Regeneration (Physiology); Seeds; Vegetation Growth; Wheat

20020044816 Scripps Institution of Oceanography, La Jolla, CA USA

Micro-Detection System for Determination of the Biotic or Abiotic Origin of Amino Acids *Final Report, 1 Jun. 1997 - 31 May 2001*

Bada, Jeffrey L., Scripps Institution of Oceanography, USA; May 01, 2002; 4p; In English

Contract(s)/Grant(s): NAG5-4938

Report No.(s): Rept-97-1103R1; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The research involved the development of a breadboard version of a spacecraft based system for the detection of amino acid chirality (handedness) on solar system bodies. The design concept has three distinct components: a sublimation chamber for the release of amino acids from an acquired sample; a microchip based capillary electrophoresis (CE) chip for the separation of amino acids and their enantiomers; and a fluorescent based detection system. In addition, we have investigated the use of a microfluidics system for the extraction of amino acids in samples in which sublimation has proven to be problematic. This is a joint project

carried out at the Scripps Institution of Oceanography (SIO), University of California at San Diego; the Jet Propulsion Laboratory (JPL), Pasadena; and the Department of Chemistry, University of California, Berkeley.

Author

Abiogenesis; Amino Acids; Detection; Oceanography; Enantiomers; Systems Engineering

20020045328 Stanford Univ., Stanford, CA USA

Oral Contraceptives and Bone Health in Female Runners *Annual Report, 29 Sep. 2000-28 Sep 2001*

Kelsey, Jennifer L.; Oct. 2001; 33p; In English

Contract(s)/Grant(s): DAMD17-98-1-8518

Report No.(s): AD-A400469; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is a two-year randomized trial of the effects of oral contraceptives on bone mass and stress fracture incidence among 150 female competitive distance runners in the age range 18-25 years. The Coordinating Center is at Stanford University and bone mass in being measured at five sites: Massachusetts General Hospital, University of California Los Angeles, University of Michigan, Stanford University/Palo Alto VA Medical Center, and Helen Hayes Hospital in West Haverstraw NY. Athletes are currently being recruited from the areas around these five clinical sites. In August 2001 we received IRB approval to expand our recruitment in the Los Angeles area to non-student runners, and this expansion has considerably increased our pool of eligible runners. to date, over all five clinical sites, 101 have been randomized and an additional 45 successfully screened and being scheduled for their bone densitometry. We expect to complete baseline examinations and randomization in early 2002. Final results will thus not be available until early 2004.

DTIC

Athletes; Bones; Density Measurement; Stress (Physiology); Epidemiology

20020045329 California Univ., San Francisco, CA USA

Therapeutic and Biologic Studies in a Murine Model of NF1 *Final Report, 23 Sep. 1998-22 Sep 2001*

Shannon, Kevin M.; Oct. 2001; 44p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8608

Report No.(s): AD-A400468; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This final report describes the outcome of a translational research project involving Nf1 mutant mice with myeloid leukemia. Progress made during the full period of support is reviewed concisely and a final summary is provided. This research study pursued two Technical Objectives. First, the therapeutic efficacy of two agents: (1) mycophenolate mofetiel (MM); and (2) a fusion toxin that targets the UM-CSF receptor was examined. These compounds represent rational new approaches for treating NF1-associated tumors. MM has been tested in the mouse model and our preliminary data indicate that it is unlikely to provide benefit to NF1 patients. However, biochemical studies demonstrated the predicted inhibitory effects on signaling through downstream effectors of Ras-GTP. We produced and purified a GM-CSF immunotoxins and tested an number of these in vitro. These studies surprisingly revealed agonist (rather than inhibitory effects) of the conjugates. The investigators are continuing to develop improved reagents. In aim 2, utilized NF1 mutant mice to extend clinical observations suggesting that individuals with NF1 are susceptible to the development of therapy-associated second cancers. These studies demonstrated dramatic cooperation between heterozygous inactivation of NF1 and exposure to mutagens in cancer development.

DTIC

Leukemias; Therapy; Clinical Medicine

20020045330 Occupational Safety and Health Administration, Washington, DC USA

Consultation Services for the Employer

Jan. 1997; 33p; In English

Report No.(s): AD-A400466; OSHA-3047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Occupational Safety and Health Administration (OSHA) is sensitive to the difficulties faced by employers who are genuinely concerned with their employees' safety and health and who wish to comply with OSHA regulations. Therefore, in addition to vigorously enforcing the regulations issued to protect Americans on-the-job, the agency operates various voluntary compliance programs that address the need for employer assistance. Foremost among these programs is OSHA Consultation, a free source of vital information and technical assistance.

DTIC

Health; Regulations; Safety; Medical Services

20020045331 Vanderbilt Univ., Nashville, TN USA

Genetic Analysis of a Mammalian Chromosomal Origin of Replication *Annual Report, 1 Aug. 2000-31 Jul. 2001*

Altman, Amy L.; Aug. 2001; 31p; In English

Contract(s)/Grant(s): DAMD17-99-1-9420

Report No.(s): AD-A400485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

    The main goal of the research proposal was to develop an assay system for studying the specific genetic elements, if any, involved in the initiation of DNA replication in mammalian cells as outlined in Task 1 (development of assay system). The completion of this task is outlined in the annual summary from last year and led to the first peer-reviewed publication resulting from this research proposal. Briefly, a competitive polymerase chain reaction (PCR)-based nascent strand abundance assay was used to demonstrate the ability of a small 5.8 kb fragment of DNA, containing the DHFR ori-beta initiation region (IR), to support efficient origin activity when integrated into random ectopic positions in the hamster chromosome. In addition, the integrated ori-beta IR functioned with the same efficiency as the endogenous ori-beta in CHOK1 cells, suggesting that the 5.8 kb fragment was an acceptable candidate for mutational analysis of the ori-beta IR.

DTIC

Assaying; Chromosomes; Deoxyribonucleic Acid; Fragments; Genetics; Cancer

20020045332 Army Research Inst. of Environmental Medicine, Natick, MA USA

Effects of Hypothermia on Rat Reticuloendothelial Blood Clearance and Particulate Uptake

DuBose, David A.; Matthew, Candace B.; Morehuse, David H.; Balcius, James A.; Sils, Ingrid V.; Mar. 2002; 20p; In English

Report No.(s): AD-A400484; USARIEM-T-02/16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

    Casualties resulting from the French and German incursions into Russia during the winters of the 19th and 20th centuries, respectively exemplify cold weather as a strategic element of war. From Valley Forge to the Chosin Reservoir, the US Army has been made aware of the influence of cold weather conditions on soldier health. In times of relative peace, cold weather injuries for troops under training or deployment exceeded 500 cases for the winter of 1999/2000. While respectively cases of frostbite, immersion foot and chilblains occur more frequently than hypothermia; this more lethal form of cold-related insult represents a soldier injury in need of remedy. However, as in the days of the American Revolution, the doctrine of increasing insulation or evacuation to warmer environments remains the primary approach to guard against hypothermic mortality. Perhaps understanding the influences of hypothermia on body systems supporting resistance to stress and trauma may reveal strategies to lessen the possibility of a lethal consequence following hypothermia. The contribution of the reticuloendothelial system (RES) to survival following traumatic stress is well documented. This is especially true for physiological insults involving vascular shock, to include that associated with heatstroke. This impact of the RES is mediated, in part by its clearance of vascular debris to support blood vessel patency. The present study examined the effect of rat whole body hypothermia and hypothermia with rewarming on RES blood clearance and PU by RES organs. Findings revealed hypothermia significantly decreased RES clearance as a result of reduced liver particulate uptake. Following active rewarming, this decrement in RES function remained. Further study is recommended to determine if modulations in RES clearance capacity alters the outcome of hypothermia. Such studies may establish RES fitness as an important concept to support reductions in cold-induced mortality.

DTIC

Hypothermia; Injuries; Particulates

20020045333 Health Research, Inc., Buffalo, NY USA

Sialyltransferase in Breast Cancer *Annual Report, 1 Sep. 2000-31 Aug. 2001*

Lau, Joseph T.; Sep. 2001; 11p; In English

Contract(s)/Grant(s): DAMD17-00-1-0653

Report No.(s): AD-A400483; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

    Alterations in sialylation are well documented in breast cancer as well as other epithelial cancers. A principal enzyme implicated in this process is the sialyltransferase ST6Gal, which mediates the synthesis of the sialyl a2,6-anomeric linkage to terminal lactosamine structures on glycoproteins, and high levels have been liked to a poor prognosis especially among patients with locally advanced stage 3 breast cancer. Transcription of the ST6Gal gene is regulated by selective use of multiple promoters in a tissue- and developmental-specific manner. We documented the existence of a breast-specific promoter that is recruited de novo to allow high ST6Gal gene expression during late pregnancy and lactation in mouse mammary glands. However we failed to detect an equivalent breast-specific promoter operative in human.

DTIC

Cancer; Mammary Glands; Enzymes

20020045347 Texas Univ., Medical School, San Antonio, TX USA

Cell Motility and Invasiveness of Neurofibromin-Deficient Neural Crest Cells and Malignant Triton Tumor Lines *Annual Report, 1 Oct. 2000-30 Sep. 2001*

Vogel, Kristine S.; Oct. 2001; 22p; In English

Contract(s)/Grant(s): DAMD17-99-1-9499

Report No.(s): AD-A400461; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our purpose is to examine the role of the NF1 gene product, neurofibromin, in modulating the migratory and invasive properties of neural crest cells (NCC) and neural crest-derived sarcoma cells. As a negative regulator of Ras signaling, neurofibromin may influence the responses of NC-derived cells to growth factors and extracellular matrix (ECM) molecules that affect motility. We use embryonic NCC and NC-derived sarcoma lines isolated from cisNf1; p53 mice to compare integrin ECM receptor expression patterns, ECM adhesion preferences, migration on ECM substrata, invasion through ECM barriers, and dispersal along NCC pathways in vivo for wild-type and neurofibromin-deficient cells. In the five months since funding was transferred to UTHSCSA, we have developed dissection and culture methods for embryonic mouse branchial arch neural crest cells, and determined that Nfl-/- maxillary and mandibular NCC are more invasive through fibronectin and laminin. In addition, we have correlated MTT phenotype with invasive potential, and characterized effects of growth factors on MTT sarcoma cell invasiveness. Our studies address two important questions: (1) what molecules control the migration and localization of NCC in the embryo? (2) which growth factor signaling pathways affect the invasiveness of NC-derived sarcoma cells?

DTIC

Cancer; In Vivo Methods and Tests; Cells (Biology); Growth; Fibrosis

20020045348 Occupational Safety and Health Administration, Washington, DC USA

The Occupational Health Professional's Services and Qualifications: Questions and Answers

Jan. 1999; 38p; In English

Report No.(s): AD-A400453; OSHA-3160; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Controlling occupational injuries and illnesses and related expenditures is a top priority in most companies. Selecting a qualified health care professional to participate in the workplace safety and health activities can be a vital step in this process. The following questions and answers are to provide guidance and serve as a resource for those considering such a selection.

DTIC

Health; Medical Services

20020045349 Northwestern Univ., Evanston, IL USA

Epstein-Barr Virus: A Role for a Tumorigenic Virus in the Etiology of Breast Cancer *Final Report, 1 Oct. 2000-30 Sep. 2001*

Longnecker, Richard M.; Oct. 2001; 17p; In English

Contract(s)/Grant(s): DAMD17-00-1-0643

Report No.(s): AD-A400450; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This proposal aimed to examine the role of a tumorigenic virus, Epstein-Barr virus (EBV), in etiology of breast cancer. EBV is an almost ubiquitous human herpesvirus that establishes lifetime latent infections in humans. It was the first human tumor virus discovered through its association with Burkitt's lymphoma in Africa. EBV infection also associates with various malignancies and proliferative syndromes, mainly affecting lymphoid and epithelial tissues. In lymphoid tissues these include Burkitt's Lymphoma, Hodgkin's disease, some adult T-cell lymphomas, and immunoblastic lymphoma in patients with immune dysfunction. EBV associates with the epithelial pathologies nasopharyngeal carcinoma and oral hairy leukoplakia. Recent studies have also found the EBV genome and viral gene expression in breast cancers using a variety of sensitive detection techniques. In the current proposal for the Department of Defense, we investigated the mechanism of EBV infection of breast epithelial cells.

DTIC

Cancer; Etiology; Mammary Glands; Tumors; Viruses

20020045351 Cold Spring Harbor Lab., Quantitative Biology, New York, NY USA

NF-1 - Regulated Adenylyl Cyclase/c AMP Pathways *Annual Report, 1 Sep. 2000-1 Sep 2001*

Zhong, Yi; Oct. 2001; 30p; In English

Contract(s)/Grant(s): DAMD17-99-1-9500

Report No.(s): AD-A400477; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project takes Drosophila NF1 mutants and mouse Nf1 mutants as models to investigate NF1-dependent regulation of the cAMP pathway. The study is intended to expand the knowledge of the genes that contribute to NF beyond the GAP-related

domain in NF1. In the last year, our work has been mainly focused on two aspects. First, the effort has been devoted to determine whether AC activity can be regulated by NF1 in vertebrates. Second, we investigated whether Ras can regulate AC activity in Drosophila. These studies have led to findings that expression of the human NF1 gene was capable of rescuing AC defects in Drosophila and G protein stimulated AC activity is reduced in mouse Nf1 knockout. It was also revealed that Ras, but not Ras-like small G proteins, was able to stimulate AC activity in a NF1 dependent manner. We are continuing to pursue a molecular understanding of this regulation and whether this pathway contributes to pathogenesis of NF1.
DTIC

Drosophila; Mutations; Proteins; Fibrosis

20020045353 Massachusetts General Hospital, Boston, MA USA
DNA Repair and Checkpoint Genes as NF1 Modifiers *Annual Report, 1 Oct. 2000-30 Sep. 2001*
Bernards, Andre; Oct. 2001; 9p; In English
Contract(s)/Grant(s): DAMD17-00-1-0538
Report No.(s): AD-A400473; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
    This study aims to determine whether common protein altering single nucleotide polymorphisms (SNPs) in DNA repair or cell cycle checkpoint genes are associated with higher or lower than average neurofibroma numbers. For this allele association study we are collecting DNAs and RNAs from NFl patients that represent the top and bottom 20% of neurofibroma burden. In the first year of this project we established contacts with 169 interested patients, identified 99 eligible individuals, and enrolled 43. DNAs from 50 anonymous patients that match our eligibility criteria have also been offered by a clinical collaborator. With recruitment ongoing, we focused on developing genotyping assays. Rather than only analyzing the limited number of genes included in an MIT Genome Center SNP discovery screen as originally planned, we used information generated by the human genome project to generate a database of 325 missense SNPs in 185 candidate genes. 57 SNPs are of special interest because their variant allele frequency is in the range for which we can expect statistically significant results. Single base extension fluorescence polarization genotyping assays for these SNPs are being developed.
DTIC

Deoxyribonucleic Acid; Genes; Proteins; Nucleotides; Genetic Engineering

20020045354 Pennsylvania Univ., Philadelphia, PA USA
Role of Murine BRCA1 Protein Interactions in DNA Repair *Annual Report, 1 Jul. 2000-30 Jun. 2001*
Boxer, Robert B.; Chodosh, Lewis A.; Jul. 2001; 12p; In English
Contract(s)/Grant(s): DAMD17-00-1-0397
Report No.(s): AD-A400472; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Amplification of the c-MYC oncogene has been found in 5-20% of breast tumors However, the molecular mechanisms by which c-MYC contributes to tumorigenesis is not well understood. to address this question, we have used the tetracycline regulatory system to conditionally express the c-MYC oncogene in the mammary epithelium of bitransgenic mice. to determine whether c-MYC induced mammary tumors remain dependent on c-MYC for maintenance of the tumorigenic state, we deinduced c-MYC expression in animals harboring tumors. Withdrawal of c-MYC expression revealed that nearly half of the tumors remain dependent on c-MYC transgene expression for their continued growth. to study the molecular properties that distinguish c-MYC dependent and independent tumors, c-MYC initiated tumors were analyzed for mutations in the ras family of genes. Approximately half of the tumors examined were found to harbor spontaneous activating point mutations in either K-ras or N-ras, whereas no mutations were found in H-ras. Interestingly, the presence of an activating ras mutation was found to strongly correlate with the failure of tumors to regress following c-MYC deinduction. These data suggest that spontaneous activating mutations in K-ras and N-ras represent a preferred secondary pathway for c-MYC-induced tumorigenesis in the mammary gland.
DTIC

Activation; Genes; Mammary Glands; Mutations; Proteins; Tumors

20020045355 Florida Univ., Gainesville, FL USA
Dissection of the Pathogenesis of Neurofibromatosis Type 1-Associated Myeloid Leukemia *Final Report, 19 Sep. 1997-18 Sep 2001*
Brannan, Camilynn T.; Oct. 2001; 26p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7339
Report No.(s): AD-A400471; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Although most of the tumors associated with neurofibromatosis type 1 (NFl) are benign in nature, malignant transformation of a subset of NF1 tumors is a serious complication, often leading to the death of the patient. This is true for NF1-associated

juvenile myelomonocytic leukemia (JMML), known to progress into acute myeloid leukemia (AML). Previously,we have shown that loss of Nfl in the hematopoetic lineage results in JMML. The goal of this grant is to identify the genetic events which lead to the transformation and leukemic progression of NF1-associated JMML using a mouse model. This model system takes advantage of transgenic mice that harbor one mutant allele of the Nfl gene, but require further mutations for transformation. We have backcrossed this mutant Nfl allele for three generations to a strain of mouse that expresses a murine leukemia virus (MuLV). In this system, the MuLV acts as a mutagen to activate cooperating cellular proto-oncogenes or inactivate tumor suppressor genes, resulting in accelerated tumor development. So far, by cloning sites of somatic MuLV integration from tumor DNAs obtained from these backcrossed mice, we have identified three loci that appear to cooperate with the loss of Nfl to cause to AML.
DTIC

Leukemias; Pathogenesis; Tumors; Neoplasms

20020045356 Pittsburgh Univ., Pittsburgh, PA USA
P53 Immune Response in Breast Cancer Patients: Assessment of CTL recognizing the HLA-A2.1 Restricted, Wild-Type Sequence p53 264-272 Epitope *Annual Report, 1 Oct. 2000-30 Sep. 2001*
DeLeo, Albert B.; Oct. 2001; 26p; In English
Contract(s)/Grant(s): DAMD17-00-1-0689
Report No.(s): AD-A400470; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Approximately 30% of breast cancer patients are p53 sero-positive and have detectable anti-p53 T cell proliferative responses. Tumors expressing mutant p53 molecules have an enhanced potential to present wild-type-sequence (wt) p53 epitopes derived from mutant p53 for T-cell recognition. Vaccines targeting these epitopes would be broadly applicable. HLA-A2.l-restricted CTL-recognizing wt P53 264-272 and 149-157 peptides have been generated from PBMC obtained from healthy donors and/or oral cancer patients. A subset of these donors were found to be non-responsive to the P53 264-272 peptide, and altered peptide ligands of this epitope were identified that induced CTL from PBMC that were non-responsive to the parental peptide. Currently, precursor CTL (pCTL) for the P53 264-272 epitope present in unstimulated PBMC can be identified by 4-color flow cytometry using soluble PE-conjugated HLA-AO2Ol/p53 peptide tetrameric complexes (tetramers). An analysis of anti-p53 pCTL in the peripheral circulation and tumors of breast cancer patients was done with tetramers for the wt P53 264-272 and 149-157 peptides. An analysis of genomic p53 exons 5-8 of the patients' tumors, when available, was also performed. The results of this study provide a basis for further investigation of the anti-p53 responses of breast cancer patients and will facilitate p53-based immunotherapy of breast cancer.
DTIC

Antigens; Cancer; Immune Systems; Mammary Glands; Peptides; Vaccines

20020045372 Albert Einstein Coll. of Medicine, Bronx, NY USA
Regulation of I Transport in Breast Cancer Cell Lines *Annual Report, 1 Jun. 2000-30 May 2001*
Riedel, Claudia; Carrasco, Nancy; Jun. 2001; 36p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0125
Report No.(s): AD-A400482; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Like thyroid tissue, breast tissue and some breast cancers are able to accumulate iodide. Iodide accumulated by the lactating breast is secreted into the milk. Iodide is then used by the nursing newborn for the biosynthesis of thyroid hormones, which are essential for the newborn's development. The capacity to accumulate iodide has been used successfully for over 50 years in the treatment of thyroid cancer by administration of radioiodide to patients. It is possible that iodide accumulation may also be used as a potential aid for diagnosis and treatment of breast cancer. The $Na(+)/I(-)$ symporter (NIS) mediates active iodide accumulation in breast and thyroid. Based on my preliminary studies in thyroid NIS, we are currently studying the regulatory mechanisms of NIS in breast cell lines. We are studying NIS regulation at both the transcriptional and post-transcriptional levels, including the role of phosphorylation in the regulation of NIS activity and its targeting to the cell surface in breast cell lines.
DTIC

Cancer; Iodides; Mammary Glands; Thyroid Gland

20020045373 Massachusetts Univ. Medical Center, Worcester, MA USA
Protective Mechanisms Against Apoptic Neurodegeneration in the Substantia Nigra *Annual Report, 1 Sep. 2000-31 Aug. 2001*
Aronin, Neil; Sep. 2001; 11p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8623
Report No.(s): AD-A400481; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal in this proposal is to understand mechanisms by which neurotoxicity destroys cells in the substantia nigra. Our hypothesis is that c-JUN kinases (JNK), which is a set of enzymes known to participate in death of neurons, mediates neurodegeneration in the substantia nigra after exposure to MPTP or glutamate excitotoxicity. Spurred by the Department of Defense (DoD) meeting in Potomac, 2001, I have extended our research in Parkinson's disease to include new strategies to improve survival of stem cells in mammalian brain. We also modified our protocol for MPTP neurotoxicity after ad hoc reviews of our data at the DoD meeting. Results in year 3 of our proposal indicated that mice lacking JNK 1 or JNK 3 lack neuroprotection against MPTP neurotoxicity, as measured by loss of tyrosine hydroxylase labeled neurons. The changes in protocol made our results more robust and reproducible, compared to the former protocol. Results favored an apoptotic pathway where JNK activity is proximal to mitochondrial initiation of apoptosis. Our group reported a role for p38 and not JNK as a target of MAP kinase apoptosis after nerve growth factor withdrawal. Mutant Huntington gene causes striatal neurons to have increased responsiveness to NMDA receptor activation. Caspase 3, a key enzyme for transducing apoptotic signals, cleaves mutant Huntington in cells transfected with Huntington cDNA and in Huntington's disease brain. Pilot results show that intravenously injected, bone-marrow derived stem cells form neuron-like cells in mice genetically engineered to accept transplanted tissues. In year 4, we will submit manuscripts on neuroprotection of JNK knockout mice for MPTP, the role of AP-1 transcription in this paradigm, and neurotoxicity of quinolinic acid in JNK knockout and Huntington's disease mouse models. We will initiate studies to improve stem cell transplantation in mouse brains after neurotoxic lesions.
DTIC
Apoptosis; Brain; Diseases; Enzymes; Neurons

20020045374 Ohio State Univ., Columbus, OH USA
Inhibition of the Pin1 Prolyl Isomerase: A Novel Approach for DNA checkpoint Abrogation in Breast Cancer Cell Lines
Final Report, 1 Sep. 2000-31 Aug. 2001
Vandre, Dale D.; Sep. 2001; 19p; In English
Contract(s)/Grant(s): DAMD17-00-1-0645
Report No.(s): AD-A400480; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We examined the hypothesis that the Pin1 prolyl isomerase plays a role in enforcing cell cycle checkpoints associated with DNA damage, and that inhibition of this enzyme would result in abrogation of the checkpoint. A set of synthetic peptides were prepared that would serve as competitive substrate inhibitors of Pin1 prolyl isomerase activity. to facilitate uptake into cells the peptides contained an amino terminal sequence of HIV-1 TAT. Negative and positive control peptides were also examined. We determined the effects of the synthetic peptide inhibitors on cell growth, abrogation of an S-phase checkpoint induced by hydroxyurea treatment, and abrogation of a G2 DNA damage checkpoint induced by bleomycin treatment. We found that none of the synthetic peptides had any affect on cell growth, nor were they effective in abrogating the S-phase checkpoint induced by hydroxyurea. However, a small but reproducible effect on DNA damaged cells was observed. The Pin1 peptide predicted to have the greatest activity induced a more rapid shift of G2 blocked cells into G1 phase after 48-72 hours following initial bleomycin exposure. Our results do not suggest that the peptide inhibitors examined here have therapeutic potential, but they do show that inhibition of Pin1 may play a role in checkpoint control. A second generation of more active Pin1 inhibitors may provide a new therapeutic approach.
DTIC
Cancer; Cell Division; Damage; Deoxyribonucleic Acid; Inhibitors; Peptides

20020045376 Georgetown Univ., Medical Center, Washington, DC USA
Structure-Based Design of erbB-2 Selective Small Molecule Kinase Inhibitors *Annual Report, 1 Jul. 2000-30 Jun. 2001*
Wang, Shaomeng; Jul. 2001; 14p; In English
Contract(s)/Grant(s): DAMD17-00-1-0274
Report No.(s): AD-A400496; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Experimental 3D structure (including the kinase domain) of either erbB-2 or EGFR has not been determined. Fortunately, the structures of the kinase domain of a number of receptor tyrosine kinases have been determined through X-ray crystallography with high resolutions. Protein kinases, including erbB-2 and EGFR, have an active and inactive conformation. Analysis of the X-ray structures of several kinases, including insulin receptor kinase and FGFR kinase showed that when an ATP analog or a small molecule kinase inhibitor bound to the ATP binding site of the kinase domain, the kinase always assumes an active conformation. Accordingly, it is hypothesized that erbB-2 and EGFR also assume an active conformation when bound to an inhibitor.
DTIC
Enzyme Activity; Inhibitors; Proteins; Cancer; Mammary Glands

20020045378 Washington Univ., Seattle, WA USA

Genetic Factors That Affect Tumorigenesis in NF1 *Annual Report, 29 Oct. 2000-28 Oct 2001*

Stephens, Karen G.; Nov. 2001; 14p; In English

Contract(s)/Grant(s): DAMD17-00-1-0542

Report No.(s): AD-A400492; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Neurofibromatosis type 1 predisposes to the growth of both benign and malignant tumors. Genetic factors, in addition to inactivation of the NF1 gene itself, clearly play a role in tumor development. Our research is focused on identifying specific DNA sequences and genetic mechanisms important in the development of cutaneous neurofibromas. We are analyzing NF1 microdeletions, which are associated with an early onset, and subsequent heavy burden, of cutaneous neurofibromas. We identified recombination hotspots where breakpoints in 75% of patients with NF1 microdeletions occur and developed assays that detect microdeletions in a patient blood sample. Near the recombination hotspots where microdeletions occur, we identified unique sequence elements that may mediate recombination at these sites and make some chromosomes susceptible to NF1 microdeletion. Unexpectedly, we found that NF1 microdeletions that arise in a somatic cell during early embryogenesis occur at different sites. An understanding of how NF1 microdeletions occur, whether some individuals are more susceptible, and why they potentiate the development of neurofibromas is important for patient care, genetic counseling, and the design of effective pharmacological intervention strategies.

DTIC

Genetics; Deoxyribonucleic Acid

20020045379 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Role of Cell Senescence in Breast Cancer *Annual Report, 1 Aug. 1998-31 Jul. 2001*

Krtolica, Ana; Aug. 2001; 46p; In English

Contract(s)/Grant(s): DAMD17-98-1-8063

Report No.(s): AD-A400490; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Cancer incidence rises exponentially with age. This project tested the hypothesis that cellular senescence of stromal fibroblasts contributes to the age-dependent increase in breast cancer by creating a more permissive environment for the expression of malignant phenotypes by breast epithelial cells. Here, we report that senescent human fibroblasts stimulate premalignant and malignant, but not normal, breast epithelial cells to proliferate in culture and form tumors in mice. In culture, the growth stimulation was evident when senescent cells comprised only 10% of the fibroblast population, and was equally robust whether senescence was induced by replicative exhaustion, oncogenic RAS, p14ARF or hydrogen peroxide. Moreover, it was due at least in part to soluble and insoluble factors secreted by senescent cells. In mice, senescent, much more than presenescent, fibroblasts caused premalignant and malignant epithelial cells to form tumors. Taken together, these results support our hypothesis that cellular senescence of stromal fibroblasts may contribute to breast tumorigenesis.

DTIC

Aging (Biology); Cancer; Fibroblasts; Mammary Glands; Tumors

20020045474 Puerto Rico Univ., San Juan, Puerto Rico

Mammogram Compliance Among Low-Income Middle-Women in Puerto Rico *Annual Report, 1 Aug. 2000-1 Aug 2001*

Sanchez-Ayendez, Melba M., Puerto Rico Univ., Puerto Rico; Sep. 2001; 119p; In English

Contract(s)/Grant(s): DAMD17-99-1-9359

Report No.(s): AD-A400641; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

   The purpose of this phase of a larger study was to obtain data about factors that explain screening mammogram referral patterns among physicians in Puerto Rico. It focused on compliance with 1997 NIH Guidelines to mammogram screening for women age 40 to 49 and 50 to 64. A self-administered questionnaire containing twelve hypothetical case studies and open questions was distributed to 50 physicians; 48 answered. Our hypothesis was: Physicians will correctly follow the NIH screening mammogram guidelines for less than 90% of their female patients in each age category. When comparing the physicians' responses with the NIH guidelines for women age 40 to 49 years old, 49.9% of the physicians coincided with the guidelines in recommending an annual exam if there are potential risk factors. For women age 50 to 64, 78% of the physicians recommended an annual mammogram according to the established guidelines. Our hypothesis was correct for both age categories: less than 90% of the physicians followed the NIH guidelines. For women age 40 to 49, where the guidelines are not as specific as for those 50 to 64 and physician- patient communication is highly recommended, the results for physicians following NIH guidelines were much less than anticipated.

DTIC

Income; Standards; Cancer; Screening; Females

20020045475 Texas Univ., Houston, TX USA

Breast Reconstruction Using Tissue Engineering *Annual Report, 1 Sep. 2000-31 Aug. 2001*

Patrick, Charles W., Jr., Texas Univ., USA; Sep. 2001; 89p; In English

Contract(s)/Grant(s): DAMD17-99-1-9268

Report No.(s): AD-A400643; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

   This is a progress report for the development of tissue engineering strategies for breast reconstruction following tumor resection: * Task 1, a long-term (12 month) in vivo study using a rat model, was initiated at the end of Year 1 of this grant. The study was completed in this Year 2 cycle of the grant. Biodegradable polymer scaffolds were fabricated, preseeded with preadipocytes (PAs), and implanted subcutaneously for 1-12 months. Quantitative histometric analysis was developed to assess the study. * The effect of hypoxia on PA viability was completed (in vivo design constraint) * The mechanisms and adhesion molecules involved in PA-material interactions is 90% complete (important for rational modification of polymer surfaces) * The development of a large animal model (pig) was initiated to address questions raised in the rat model. * The development of breast-shaped scaffolds has progressed to a 2% generation virtual model of the breast based on patient-specific data. * New polymer hydrogels are being investigated for adipose tissue engineering strategies. * Support for a PhD and BS candidate as well as two technicians was provided. Academic outcome metrics (publications, presentations, etc) have been positive.

DTIC

Cancer; Tissue Engineering; Tissues (Biology); Mammary Glands

20020045476 Michigan Univ., Ann Arbor, MI USA

Computer-Aided Classification of Malignant and Benign Lesions on Mammograms *Final Report, 1 May 1996-30 Apr. 2001*

Sahiner, Berkman, Michigan Univ., USA; May 2001; 243p; In English

Contract(s)/Grant(s): DAMD17-96-1-6012

Report No.(s): AD-A400645; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

   New methods have been investigated for computerized characterization of mammographic masses and microcalcifications. A mass segmentation method based on an active contour model was developed. The resulting segmentation algorithm was shown to be within the inter-observation variation of radiologists' hand segmentation. Morphological, texture, and spiculation features were extracted from the segmented mass and its margins. New classifiers based on statistical methods, genetic algorithms and neural networks were developed. The high-sensitivity classifier developed in this project was shown to have a significantly higher sensitivity than competing classifiers at the same specificity levels. The effect of the mass classification algorithm on radiologists' classification was evaluated using an observer study. It was shown that the radiologists' classification was significantly improved when they were aided by the computerized classification scores. A microcalcification detection algorithm was applied for automated detection of individual microcalcifications with a region of interest. The individual microcalcifications were segmented from the background using an automated algorithm. Morphological and texture features were extracted from computer%detected microcalcifications, and were used in a statistical classifier to distinguish between malignant and benign microcalcifications. Using an observer performance study, it was shown that the developed automated microcalcification characterization method was significantly more accurate than experienced radiologists.

DTIC

Cancer; Computer Techniques; Genetic Algorithms; Computer Aided Design

20020045479 Alabama Univ., Birmingham, AL USA

Cloning of Tumor Suppressor Genes in Prostate Cancer by a Novel Tumor Reversion Method *Final Report, 17 Aug. 1998-16 Feb. 2002*

Bolger, Graeme B.; Mar. 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-98-1-8639

Report No.(s): AD-A400784; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   We have developed a novel approach to the cloning of tumor suppressor genes in prostate cancer. We have transferred large pieces of human DNA, cloned into bacterial artificial chromosomes (BACs), into human prostate cancer cell lines. We then tested the ability of the transferred human DNA to revert (render less tumorigenic) the neoplastic phenotype of the cancer cell lines, using several criteria, including morphological changes in the cells, doubling time and growth in soft agar. We have found several BACs that revert human prostate cancer cell lines in this assay. We are now testing the ability of cDNAs encoded by genes on these BACs to revert the cell lines, using identical assays. This process should allow us to identify the putative tumor suppressor gene on the

BACs. Our approach is potentially applicable to the cloning of any human prostate tumor suppressor gene, and thus is of potentially major importance.
DTIC

Cancer; Cloning (Biology); Deoxyribonucleic Acid; Genes; Prostate Gland; Suppressors; Tumors

20020045480 Wisconsin Univ., Dept. of Electrical and Computer Engineering, Madison, WI USA

Nanoscale Field Localization for Manipulation and Probing of Computationally Interesting Biomolecules *Final Report, 14 Aug. 2000-30 Apr. 2001*

Weide, D. W.; Apr. 2001; 5p; In English

Contract(s)/Grant(s): N0014-00-1-G-0924

Report No.(s): AD-A400783; 144-JJ53; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Several new and important results were enabled by this grant, which was to build a bioelectronic interface to single protein molecules. This interface consists of both environmental and mechanical supports for a membrane protein. While supported membranes are being studied in many laboratories, single channel probing has been performed almost exclusively with voltage-clamp techniques, by using fragile glass pipettes, or with cumbersome planar bilayer equipment unsuitable for field deployment. Single channel recording cannot yet be done on supported membranes. In this work, multifunctional scanned probe microscope tips were designed and fabricated to use in accessing the state of a membrane porin protein using microwave reflection and transmission, as well as fluorescent probing using photodiode probes. Specific accomplishments were: development of a micromachined probe process and several probes to perform combined scanning force microscopy together with microwave probing, development of a companion process for combined optical and scanning force probing, imaging of calcium waves in brain slices, and preliminary results on single-protein probing with both direct-current and high-frequency probes.
DTIC

Membranes; Proteins; Scanning Electron Microscopy; Near Fields; Electron Probes

20020045484 RAND Corp., Santa Monica, CA USA

Does Early Smoking Signal Later Problems

Jan. 2002; 4p; In English

Report No.(s): AD-A400787; RAND/RB-4547; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The observation that adolescents who smoke also tend to have a variety of other problems (including the use of alcohol and other drugs, academic difficulties, delinquency, and impaired relationships) is not new. But a recent series of studies by Phyllis Ellickion and her colleagues at RAND has extended those observations to examine the long-term social consequences of smoking in early adolescence. Whereas earlier studies focused on older adolescents, we have examined the trajectory of smoking from the middle school years to the end of high school and have assessed the association between early smoking (both committed smoking and 'experimenting') and other concurrent high-risk behaviors as well as later behaviors. We found that even occasional smoking during the middle school years may contribute to later problems, including dropping out of high school. The RAND Adolescent Panel Study was a longitudinal study of middle (junior) high school students from California and Oregon conducted to evaluate a drug prevention program we had developed for middle school children. We surveyed participants as seventh graders in 1985 and then, again, five years later. Rigorous tracking allowed us to retain nearly 70 percent of the seventh grade sample over this five-year period; weighting the sample allowed us to compensate for the remaining attrition.
DTIC

Children; Tobacco; Psychological Effects

20020045493 FROM

South Oxnard Challenge Project. Report of What Works

Lane, Jodi; Schroeder, Amber; Turner, Susan; Fain, Terry; Jan. 2002; 54p; In English

Report No.(s): AD-A400725; MR-1520/1-VC; X5-X5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

THE SOUTH OXNARD CHALLENGE PROJECT (SOCP) The South Oxnard Challenge Project was developed as a demonstration project to test through a randomized experiment the practical applicability of Clear's restorative justice theory and to examine the results of the newly developed collaborative approach to juvenile justice in South Oxnard. The SOCP was a collaborative project between the County, City and private non-profit agencies. The major participants in the collaborative were the Ventura County Probation Agency, Ventura County Behavioral Health Department (Drug and Alcohol Programs, Mental Health Services), City Corps (Oxnard), City of Oxnard Recreation Department Oxnard Police Department, El Concilio De Condado De Ventura, Interface Children Family Services, and Palmer Drug Abuse Program (PDAP). Participants from these agencies jointly determined treatment approaches and delivered services using a team approach. Direct provision of services

constituted one of the primary differences between SOCP and regular juvenile probation where youth are "referred out" for services with periodic follow-up.
DTIC
Law (Jurisprudence); Mental Health

20020045500 Department of Defense, Arlington, VA USA
Information Technology: The Preventive Health Care Application and an Associated Upgrade
Apr. 12, 2002; 20p; In English
Report No.(s): AD-A400710; IG/DOD-D-2002-081; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The Preventive Health Care Application was a tool designed to enable clinicians to deliver and track appropriate and timely preventive services provided to all enrolled military health system members. The Preventive Health Care Application, which included three off-the-shelf modules, was developed to support the Put Prevention Into Practice program by providing health care providers the ability to gather, maintain, retrieve, manipulate, analyze, display, and print preventive health care information. Beginning in 1996, the Office of the Assistant Secretary of Defense (Health Affairs) developed the Preventive Health Care Application to be a stand-alone application that would interface with the Composite Health Care System II.
DTIC
Health Physics; Military Technology; Information Management

20020045527 Texas A&M Univ., College Station, TX USA
Genetically Engineered Pores for Sensing Metal Ions *Final Report, 1 Jan. 1997-30 Sep. 2000*
Bayley, Hagan; Sep. 2000; 7p; In English
Contract(s)/Grant(s): N00014-97-1-0228
Report No.(s): AD-A400504; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   The objective of this research was to discover engineered variants of a self assembling pore-forming protein, staphylococcal alpha-hemolysin (alpha-HL), which can be used as components of sensors for M(II).
DTIC
Detection; Metal Ions; Staphylococcus; Proteins

20020045539 Massachusetts General Hospital, Boston, MA USA
Preclinical Evaluation of Gene Therapy for NF2 Lesions in Mouse Models Using Amplicon Vectors and Prodrug Activation *Annual Report, 1 Oct. 2000-1 Oct 2001*
Breakefield, Xandra O.; Ramesh, Vijaya; Kumar, S. M.; Tang, Y.; Giovannini, M.; Nov. 2001; 34p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0537
Report No.(s): AD-A400508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Spontaneous schwannomas were detected in a transgenic murine model of NF2 by Magnetic Resonance Imaging (MRI). Tumors were detected in the central and peripheral nervous system, in smooth muscles of the uterus and limbs, and in the intercostals muscles of adult mice. These tumors display isointensity with other organs following T1 weighted image sequences and hyperintensity following T2-weighted image sequences, which are characteristic features of schwannomas in humans. Hematoxylin and EOSin (H and E) staining and immunohistochemistry indicate that these tumors consist of schwannomas and Schwann cell hyperplasias. Tumors stain positively for 8.100, a marker for cells of Schwann cell origin, and VSV-(i, a marker for the mutated NF2 transgene placed under the control of the Schwann cell-specific PO promoter. Preliminary evidence suggests that these tumors are highly infectable with the replicational-conditional virus HSV vector, hrR3, which contains the reporter gene, lacZ. In addition, we have been successful in producing meningiomas in the ventricles and brain parenchyma of immunodeficient mice by injection of a malignant human meningioma cell line, F5, into the ventricles. This cell line also appears to highly infectable with HSV vectors. Thus, two NF2 tumor models have been established in mice appropriate for testing of therapeutic HSV vectors.
DTIC
Gene Therapy; Muscles; Tumors; Clinical Medicine; Genes

20020045541 Texas Univ. Health Science Center, San Antonio, TX USA
Involvement of BRCA2 Repeats in RAD51 Mediated DNA Repair *Annual Report, 1 Dec. 2000-30 Nov. 2001*
Zhong, Qing; Dec. 2001; 14p; In English
Contract(s)/Grant(s): DAMD17-00-1-0457
Report No.(s): AD-A400499; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall goal of my grant proposal is to study how BRCA2 is involved in repairing DNA damage. A better understanding of BRCA2's role in breast cancer could prevent cancer formation and reduce resistance to cancer therapies. To test our hypothesis, we proposed to accomplish the following specific aims: (1) To test the importance of BRC repeats in BRCA2 for binding to Rad5l in response to DNA damage; and (2) to determine the critical residues in the BRC repeats of BRCA2 and the significance of these residues for BRCA2/Rad511 interactions. We screened for BRC repeat mutant that fail to bind to RAD511 through random mutagenesis, and one of the mutants competitively inhibited BRC-RAD511 binding was specifically identified and used for subsequent analysis. We established cell lines tetracycline-controlled inducibly expressing of wild-type BRC repeat-UFP fusion peptides or mutant BRC repeat-GFP fusion peptide in MCF7 cells. We found that endogenous BRCA2-RAD51 binding was abolished by wild-type BRC repeat but not mutant BRC repeats. The characterization of BRC repeat inducible expression cell lines in DNA damage response and DNA repair will represent an important step toward our goal in understanding the significance of the interaction between BRCA2 and RAD51 repair complex.
DTIC
Cancer; Damage; Deoxyribonucleic Acid; Genetic Engineering

20020045542 Mayo Clinic, Rochester, MN USA
Molecular Detection of Circulating Cancer Cells for Early Diagnosis of Breast Cancer *Annual Report, 1 Oct. 2000-30 Sep. 2001*
Reinholz, Monica M.; Roche, Patrick C.; Oct. 2001; 6p; In English
Contract(s)/Grant(s): DAMD17-00-1-0633
Report No.(s): AD-A400500; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   The goal of this project is to detect circulating cancer cells using breast-specific tumor markers in the blood from 200 patients who have suspicious mammograms and breast tissue biopsies. These molecular detection results will be correlated with the biopsy results. Because this study just recently opened in July, 2001, we have collected blood from 54 patients with suspicious mammograms immediately prior to a breast tissue biopsy. These patients were informed of the investigational aspects of this study and have given written consent in accordance with institutional and federal guidelines. Isolation of mononuclear cells by density gradient centrifugation and immunomagnetic capture of epithelial cells from all the collected blood samples have been performed. Isolation and reverse transcription of mRNA from each accrued sample are currently in progress. After reverse transcription, cDNA from each sample will be amplified using fluorescent-based kinetic PCR with gene-specific primers. Circulating cancer cells will be detected using mammaglobin, B305D, and B726P, which are breast-specific genes, and gamma-aminobutyrate type A receptor it subunit, cytokeratin-1 9, and beta-actin. We have collected 25% of the proposed 200 sample accrual, and the molecular detection of circulating cancer cells from the collected samples is in progress.
DTIC
Cancer; Blood Circulation; Mammary Glands

20020045543 Massachusetts General Hospital, Boston, MA USA
Functional Analysis of Neurofibromin: Clues from Drosophila Applied to Mammalian Systems *Annual Report, 1 Oct. 2000-1 Oct 2001*
Foster, Rosemary; Nov. 2001; 10p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0547
Report No.(s): AD-A400501; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   The purpose of our research is the generation of relevant biological assay systems in which Ras-independent effects of neurofibromin on cellular proliferation can be readily assessed. Our primary efforts have been aimed at overcoming the long-standing difficulties of manipulating normal and mutant forms of neurofibromin in mammalian cells. We have focused on the development of tightly controlled expression systems using both a vector-based ecdysone system and a tetracycline-regulated HSV amplicon system in established NIH3T3 murine fibroblasts and primary neurofibromin-deficient mouse embryo fibroblasts. Our progress has been severely limited by technical difficulties with both systems that have prevented the establishment of reliably inducible exogenous neurofibromin expression in either cell type. We are now utilizing a recently described retroviral based ecdysone expression system since stable trans-activator-expressing NIH3T3 lines in this system are available. Additionally, expanded transgene delivery into poorly transfected cell lines is afforded by retrovirus infection. These important features will overcome the two major obstacles that have hampered our progress to date. The revised experiments outlined in this report will lay the foundation for further investigation of the complex role of neurofibromin in cellular growth control mediated through its Ras-dependent and Ras-independent functions.
DTIC
Fibroblasts; Functional Analysis; Regeneration (Physiology); Fibrosis

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20020044094 NASA Ames Research Center, Moffett Field, CA USA
Neuroelectric Virtual Devices
Wheeler, Kevin, NASA Ames Research Center, USA; Jorgensen, Charles, NASA Ames Research Center, USA; [2000]; 19p; In English; NASA DoD Workshop on Bio-Inspired Engineering for Exploration Systems, 4-6 Dec. 2000, Pasadena, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents recent results in neuroelectric pattern recognition of electromyographic (EMG) signals used to control virtual computer input devices. The devices are designed to substitute for the functions of both a traditional joystick and keyboard entry method. We demonstrate recognition accuracy through neuroelectric control of a 757 class simulation aircraft landing at San Francisco International Airport using a virtual joystick as shown. This is accomplished by a pilot closing his fist in empty air and performing control movements that are captured by a dry electrode array on the arm which are then analyzed and routed through a flight director permitting full pilot outer loop control of the simulation. We then demonstrate finer grain motor pattern recognition through a virtual keyboard by having a typist tap his traders on a typical desk in a touch typist position. The EMG signals are then translated to keyboard presses and displayed. The paper describes the bioelectric pattern recognition methodology common to both examples. Figure 2 depicts raw EMG data from typing, the numeral '8' and the numeral '9'. These two gestures are very close in appearance and statistical properties yet are distinguishable by our hidden Kharkov model algorithms. Extensions of this work to NASA emissions and robotic control are considered.
Author
Electromyography; Pattern Recognition; Bioelectricity; Neuromuscular Transmission

20020045488 Army Soldier and Biological Chemical Command, Natick, MA USA
Effects of Weight Carried by Soldiers: Combined Analysis of Four Studies on Maximal Performance, Physiology, and Biomechanics *Final Report, 1 May 2000-1 Sep. 2001*
Polcyn, Amy F.; Bensel, Carolyn K.; Harman, Everett A.; Obusek, John P.; Pandorf, Clay; Feb. 2002; 66p; In English
Report No.(s): AD-A400722; NATICK/TR-02/010; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Data from four studies of standard and prototype load-carriage equipment were analyzed to determine the effects of the weight borne by male and female load carriers on time to traverse a 3.2-km course at maximal speed and on energy expenditure and kinetic and kinematic variables during externally paced walking at 4.8 km-1 hr. The equipment configurations included fighting, approach, and sustainment loads, with masses varying from 12 kg to 50 kg. It was found that course completion times and energy expenditure were directly related to the weight carried. Kinetic variables, including ground and joint reaction forces, generally evidenced substantial linear relationships with the weight carried. Increases in maximum ankle, knee and hip joint reaction forces approached 1 N for each 1 N increase in the weight. The effects of weight carried on the kinematic variables were more complex. They included evidence of adaptations in walking gait that are likely to aid the load carrier in maintaining stability and in absorbing the increased forces associated with increased load on the body.
DTIC
Stress (Physiology); Biodynamics; Portable Equipment; Joints (Anatomy); Weight (Mass)

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20020045203 NASA Ames Research Center, Moffett Field, CA USA
Dual-Task Interference When A Response is Not Required
VanSelst, Mark, NASA Ames Research Center, USA; Johnston, James C., NASA Ames Research Center, USA; 20020101; 7p; In English; Cognitive Science Society 19th Annual Meeting, 1997, Stanford, CA, USA
Contract(s)/Grant(s): RTOP 538-04-23; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

When subjects are required to respond to two stimuli presented in rapid succession, responses to the second stimulus are delayed. Such dual-task interference has been attributed to a fundamental processing bottleneck preventing simultaneous

processing on both tasks. Two experiments show dual-task interference even when the first task does not require a response. The observed interference is caused by a bottleneck in central cognitive processing, rather than in response initiation or execution. Author

Cognitive Psychology; Interference; Perception

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20020044822 Sverdrup Technology, Inc., USA

Ground Test of the Urine Processing Assembly for Accelerations and Transfer Functions

Houston, Janice, Sverdrup Technology, Inc., USA; December 2001; 21p; In English; Microgravity Integrated Product Team/Microgravity Analysis Team Meeting, 12 Mar. 2002, Houston, TX, USA

Contract(s)/Grant(s): NAS8-40386

Report No.(s): MG-01-677; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the ground test of the urine processing assembly for accelerations and transfer functions. Details are given on the test setup, test data, data analysis, analytical results, and microgravity assessment. The conclusions of the tests include the following: (1) the single input/multiple output method is useful if the data is acquired by tri-axial accelerometers and inputs can be considered uncorrelated; (2) tying coherence with the matrix yields higher confidence in results; (3) the WRS#2 rack ORUs need to be isolated; (4) and future work includes a plan for characterizing performance of isolation materials.

Derived from text

Ground Tests; Transfer Functions; Urine; Waste Utilization; Water Reclamation

20020045548 Iowa State Univ. of Science and Technology, Ames, IA USA

Evaluating Human Operator Performance in a Fully Immersive Virtual Reality Environment *Final Report, 15 Apr. 2000-14 Jul. 2001*

Bernard, James E.; Cruz Neira, Carolina; Mar. 15, 2002; 13p; In English

Contract(s)/Grant(s): F49620-00-1-0267; AF Proj. 3484

Report No.(s): AD-A400507; AFRL-SR-BL-TR-02-0128; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Virtual Reality Applications Center is a national leader in the increasingly important field of applications of virtual reality to the challenges of engineering and science. This DURIP contract provided peripheral equipment for VRAC's C6, a 360-degree immersion device used to display synthetic environments in real time. C6 includes six stereoscopic screens, a three-dimensional sound system, and wireless technologies. C6, which cost over $5 million to design and build, was made possible by support from the Air Force of Scientific Research, the National Science Foundation, Iowa State University and private industry. DURIP funds helped purchase a tracking system, networking hardware, and storage devices crucial to the operation of the system. We are now using the C6 on two major defense related projects applying virtual reality interfaces to improve operational readiness and situational awareness. The first of these projects, sponsored by the Air Force Research Lab's Human Effectiveness Directorate, is investigating the use of collaborative computer immersion to recreate a Joint Battlespace. The second is a multi-year collaboration between a VRAC research team, the Iowa National Guard, and the Iowa Technology Center. The objective of this effort is to investigate, create and evaluate the use of immersive interfaces as tools to improve the operational readiness of Iowa National Guard staff, both Army and Air.

DTIC

Maintainability; Operator Performance; Virtual Reality; Man Machine Systems

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.

20020044543 NASA Ames Research Center, Moffett Field, CA USA
Exploring for Martian Life
Farmer, Jack D., NASA Ames Research Center, USA; [1997]; 1p; In English; American Physical Society/American Association of Physics Teachers Conference, 18 Apr. 1997, Washington, DC, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): RTOP 344-38-32; Copyright; Avail: Issuing Activity; Abstract Only

During the next decade, robotic field science will play an essential role in advancing our understanding of Martian history. Specifically, capable rovers are needed to survey a broad range of Martian rock types for in situ chemistry and mineralogy as a basis for interpreting globally-distributed data obtained from orbit. The relationship between orbital and landed science will be fundamental in selecting a landing site for future missions aimed at probing the ancient rock record for evidence of: (1) past life or prebiotic chemistry; (2) the climate and volatile history of Mars; and (3) candidate materials for in situ resource utilization.
Author (revised)
Mars Surface; Mineralogy; Planetary Geology; Robotics; Roving Vehicles

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20020044544 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands
Geometric Baecklund-Darboux Transformations for the KP Hierarchy
Helminck, G. F.; van de Leur, J. W.; Nov. 2000; 40p; In English
Report No.(s): PB2002-102987; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper it is shown that, if you have two planes in the Sato Grassmannian that have an intersection of finite co-dimension, then the corresponding solutions of the KP hierarchy are linked by Baecklund-Darboux (shortly BD-)transformations. The pseudodifferential operator that performs this performs the transformation is shown to be built up in a geometric way from so-called elementary BD-transformations and is given here in a closed form. The corresponding action on the tau-function, associated to a plane in the Grassmannian, is also determined.
NTIS
Hierarchies; Transformations (Mathematics)

20020044548 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands
Disproof of an Admissibility Conjecture of Weiss
Jacob, B.; Aug. 2000; 24p; In English
Report No.(s): PB2002-102927; MEMO-1539; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two conjectures on admissible control operators by George Weiss are disproved in this paper. One conjecture says that an operator B defined on an infinite-dimensional Hilbert space U is an admissible control operator if for every element u epsilon U the vector Bu defines an admissible control operator. The other conjecture says that B is an admissible control operator if a certain resolvent condition is satisfied. The examples given in this paper show that even for analytic semigroups the conjectures do not hold. In the last section we show that this example leads to a semigroup example showing that the first estimate in the Hille-Yosida Theorem is not sufficient to conclude boundedness of the semigroup.
NTIS
Group Theory; Hilbert Space

20020044828 NASA Langley Research Center, Hampton, VA USA
A PVS Prover Strategy Package for Common Manipulations
DiVito, Ben L., NASA Langley Research Center, USA; April 2002; 75p; In English
Contract(s)/Grant(s): RTOP 704-01-50-01

Sequent manipulations for an interactive prover such as PVS can often be labor intensive. We describe an approach to tactic-based proving for improved interactive deduction in specialized domains. An experimental package of strategies (tactics) and support functions has been developed for PVS to reduce the tedium of arithmetic manipulation. Included are strategies aimed at algebraic simplification of real-valued expressions as well as term-access techniques applicable in arbitrary settings. The approach is general enough to serve in other mathematical domains and for provers other than PVS. This report presents the full set of arithmetic strategies and discusses how they are invoked within the prover. Included is a description of the extended expression notation for accessing terms as well as a substitution technique provided for higher-order strategies. Several sample proofs are displayed in full to show how the strategies might be used in practice.

Author

Theorem Proving; Computer Programs; Algebra

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20020044097 NASA Langley Research Center, Hampton, VA USA

Fly-By-Light/Power-By-Wire Fault-Tolerant Fiber-Optic Backplane

Malekpour, Mahyar R., NASA Langley Research Center, USA; April 2002; 117p; In English

Contract(s)/Grant(s): RTOP 728-30-10-03

Report No.(s): NASA/TM-2002-211632; L-18158; NAS: 1.15:211632; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The design and development of a fault-tolerant fiber-optic backplane to demonstrate feasibility of such architecture is presented. The simulation results of test cases on the backplane in the advent of induced faults are presented, and the fault recovery capability of the architecture is demonstrated. The architecture was designed, developed, and implemented using the Very High Speed Integrated Circuits (VHSIC) Hardware Description Language (VHDL). The architecture was synthesized and implemented in hardware using Field Programmable Gate Arrays (FPGA) on multiple prototype boards.

Author

Fault Tolerance; Field-Programmable Gate Arrays; Hardware Description Languages; VHSIC (Circuits); Architecture (Computers); Computer Systems Design; Computer Systems Performance

20020045440 Seagate Research, Pittsburgh, PA USA

Perpendicular Recording: A Future Technology or a Temporary Solution

Litvinov, Dmitri, Seagate Research, USA; Khizroev, Sakhrat, Seagate Research, USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 1-19; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

During the vitally critical times to the future advances in data storage technologies, perpendicular magnetic recording has attracted a substantial amount of attention as a prime alternative to the technologies in place today. As envisioned by the industry and academia leaders, perpendicular recording is the most likely candidate for the technology implemented in the next generations of hard drives. The most competitive virtue of this technology is the fact that while being technically the closest alternative to conventional longitudinal recording, it is capable of extending the (superparamagnetic) density limit beyond what is achievable with longitudinal recording. It is widely believed that perpendicular magnetic recording paradigm will enable to sustain the current great strides in technological advances for the next several generations of magnetic storage solutions. This paper will cover the basic principles undelying perpendicular recording as well as the challenger associated with implementing the technology.

Author

Data Storage; Magnetic Storage

20020045441 Ciprico, Inc., Advanced Concepts, Plymouth, MN USA

OSD: A Tutorial on Object Storage Devices

Ruwart, Thomas M., Ciprico, Inc., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 21-34; In English; Also announced as

20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Ever since online digital storage devices were first introduced in the late 1950's and early 1960's, the various functions key to storing data on these devices have been slowly migrating into the devices themselves. Early disk drives would send analog signals from the read/write head to a physically separate box that would deserialize and frame data into bytes. This data would then be sent to other processors to perform redundancy checks and data transmission to the requesting computer system. As engineers were able to fit more functionality into smaller spaces at reasonable costs, these key functions were migrated into the disk drive itself to the point where we now have an entirely self-contained unit complete with all the electronics that used to fill a small room. However, even with the integrated advanced electronics, processors, and buffer caches, these disk drives are still relatively "dumb" devices. They essentially perform only two functions: read data and write data. Furthermore, the disk drives do not know anything about the data that they are storing. Things such as content, structure, relationships, quality of service, ...etc. are all pieces of information that are external to the disk drive itself The basic premise of Object Storage Devices is that the disk drive or, more generically, the storage device, can be a far more useful device if it had more information about the data it manages and was able to act on it. This paper is intended to provide the reader with an overview of OSD, its history, its current state, and possible futures. It begins by presenting a brief history of Object Storage Devices and then discusses why OSD is an important step in the evolution of storage technologies in general. The basic OSD architecture is compared with current Direct Attached Storage (DAS), Storage Area Network (SAN), and Network Attached Storage (NAS) architectures in terms of management, device and data sharing, performance, scalability, and device functionality. Finally, the current status of OSD and related roadmaps are presented as a frame of reference.
Author
Computer Storage Devices; Data Transmission; Analog Data

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20020044103 Research Inst. for Advanced Computer Science, Moffett Field, CA USA
Survey of NASA V and V Processes/Methods
Pecheur, Charles, Research Inst. for Advanced Computer Science, USA; Nelson, Stacy, Computer Sciences Corp., USA; April 2002; 92p; In English
Contract(s)/Grant(s): NRA-8-30/TA-5/Northrop-Grumman
Report No.(s): NASA/CR-2002-211401; NAS 1.26:211401; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this report is to describe current NASA Verification and Validation (V&V) techniques and to explain how these techniques are applicable to 2nd Generation RLV Integrated Vehicle Health Management (IVHM) software. It also contains recommendations for special V&V requirements for IVHM. This report is divided into the following three sections: 1) Survey - Current NASA V&V Processes/Methods; 2) Applicability of NASA V&V to 2nd Generation RLV IVHM; and 3) Special 2nd Generation RLV IVHM V&V Requirements.
Author
Systems Integration; Program Verification (Computers); Software Engineering; NASA Programs; Surveys

20020044137 NASA Ames Research Center, Moffett Field, CA USA
NAS Grid Benchmarks: A Tool for Measuring Performance of Computational Grids
VanderWijngaart, Rob F., NASA Ames Research Center, USA; Frumkin, Michael, NASA Ames Research Center, USA; [2001]; 3p; In English; 3rd; Third Global Grid Forum, 7-10 Oct. 2001, Frascati, Italy
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This viewgraph presentation includes a brief history of benchmarking computational grids at NASA Ames, measuring grid performance and preliminary results of recent studies.
CASI
Computational Grids; Computer Programs; Performance; Efficiency

20020044501 Massachusetts Inst. of Tech., Cambridge, MA USA
Hawk: Knowledge Acquisition Starting With Natural Language *Final Report, Mar. 1998-Dec. 2001*
Katz, Boris; Borchardt, Gary; Felshin, Sue; Feb. 2002; 21p; In English; Original contains color images
Contract(s)/Grant(s): F30602-98-1-0036; Proj-IIST
Report No.(s): AD-A400198; AFRL-IF-RS-TR-2002-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   DARPA's Rapid Knowledge Formation program is developing new technology to automate the task of transforming raw human-understandable information into encoded, machine-understandable information. The project described in this report addresses a central subtask of this task: converting natural language text into and encoded representation that can support computer inference. The technical approach taken in this effort is based on two key insights: First, we can make the translation task manageable by breaking it into successive stages of isolating information, then standardizing it, then encoding it, with each stage facilitated by proven components of natural language processing technology. Second, we can gain leverage during the translation process by exploiting human interaction at a number of distinct points along the way.
DTIC
Coding; Natural Language (Computers); Data Transmission

20020044502 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Quicklook Air Mobility Modeling
Pektas, Mustafa k.; Mar. 2002; 121p; In English; Original contains color images
Report No.(s): AD-A400200; AFIT/GOR/ENS/02-14; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

   In this research we focused on the mobility system modeled by the AMC mobility planner's calculator (AMPCALC). We developed AMPCALC as a user-friendly tool and allow the user to easily carry out strategic airlift, air refueling and aeromedical evacuation calculations that are covered in Air Force Pamphlet 10-1403. In this study, Excel software and its macro language, Visual Basic for Application, are our two main tools. In the methodology of the thesis we examined fundamental aspects of the mobility system in AMPCALC. We discussed formulation logic of the mobility cycle. We presented ramp use optimization and tanker optimization processes. We also conducted verification and validation of AMPCALC. Sensitivity analysis of the model includes a response surface study. To be able to investigate the main effects and interaction effects of the input factors on closure time, we performed a 26 factorial design. No linear relations are observed, but some relations between inputs and closure time are observed.
DTIC
Models; Computer Programming; Programming Languages; Air to Air Refueling

20020044539 California Univ., Dept. of Earth Sciences, Riverside, CA USA
Development of Software for Spatially and Temporally Resolving Motor Vehicle Activity Data *Final Report*
Chou, Y. H.; Jul. 31, 2000; 78p; In English
Report No.(s): PB2002-102759; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

   The objective of this project is to develop a customized Geographic Information System (GIS) software application to spatially and temporally allocate Positioning System (GPS) instrumented vehicle activity data and provide summary statistics at a range of spatial and temporal resolutions. Major research activities were made in three areas: (1) correct translation of vehicle location data into meaningful routing information necessary for construction of trip patterns, (2) effective organization of both digital street maps and vehicle data in a comprehensive database required for compilation of critical statistics for analysis of mobile source emissions at desirable geographic configurations, and (3) incorporation of mapping and database management capabilities into a user-friendly, automated procedure suitable for analysis of the spatially and temporally resolved motor vehicle activity based on the huge volumes of GPS-instrumented vehicle data. A analytical application is built on ESRI's ArcView GIS for ARB researchers to carry out a wide range of motor vehicle travel data analyses.
NTIS
Computer Programming; Data Processing; Data Bases; Data Base Management Systems; Motor Vehicles

20020045176 Zurich Univ., Remote Sensing Labs., Switzerland
MODO: An Interface to MODTRAN for the Simulation of Imaging Spectrometry At-Sensor Signals
Schlaepfer, Daniel, Zurich Univ., Switzerland; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 343-350; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

   The radiative transfer code MODTRAN, version 4 has been established as de-facto standard for the simulation of imaging spectrometry data and for quantitative modelling of the signal at the sensor level. The original interface of MODTRAN consisting of ASCII-file based inputs leads often to misunderstandings and mistakes in such analyses. Almost every frequent user of

MODTRAN has therefore some tools available to ease the setup of the inputs. The MODTRAN interface described in this paper includes an extensive translation of the logical structure and the parameters of the input tape5 as well as utilities for the extraction and convolution of radiation component spectra. It also supports surface reflectance spectra from external data sources. Its functionality including the workflow is described first. Some examples for the simulation of imaging spectrometry radiance levels follows.

Author

Computerized Simulation; Data Processing; Graphical User Interface; Computer Programs

20020045219 NASA Ames Research Center, Moffett Field, CA USA

Efficacy of Code Optimization on Cache-based Processors

VanderWijngaart, Rob F., MRJ Technology Solutions, Inc., USA; Apr. 10, 1997; 22p; In English

Contract(s)/Grant(s): NAS2-14303

Report No.(s): NAS-97-012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The current common wisdom in the U.S. is that the powerful, cost-effective supercomputers of tomorrow will be based on commodity (RISC) micro-processors with cache memories. Already, most distributed systems in the world use such hardware as building blocks. This shift away from vector supercomputers and towards cache-based systems has brought about a change in programming paradigm, even when ignoring issues of parallelism. Vector machines require inner-loop independence and regular, non-pathological memory strides (usually this means: non-power-of-two strides) to allow efficient vectorization of array operations. Cache-based systems require spatial and temporal locality of data, so that data once read from main memory and stored in high-speed cache memory is used optimally before being written back to main memory. This means that the most cache-friendly array operations are those that feature zero or unit stride, so that each unit of data read from main memory (a cache line) contains information for the next iteration in the loop. Moreover, loops ought to be 'fat', meaning that as many operations as possible are performed on cache data-provided instruction caches do not overflow and enough registers are available. If unit stride is not possible, for example because of some data dependency, then care must be taken to avoid pathological strides, just ads on vector computers. For cache-based systems the issues are more complex, due to the effects of associativity and of non-unit block (cache line) size. But there is more to the story. Most modern micro-processors are superscalar, which means that they can issue several (arithmetic) instructions per clock cycle, provided that there are enough independent instructions in the loop body. This is another argument for providing fat loop bodies. With these restrictions, it appears fairly straightforward to produce code that will run efficiently on any cache-based system. It can be argued that although some of the important computational algorithms employed at NASA Ames require different programming styles on vector machines and cache-based machines, respectively, neither architecture class appeared to be favored by particular algorithms in principle. Practice tells us that the situation is more complicated. This report presents observations and some analysis of performance tuning for cache-based systems. We point out several counterintuitive results that serve as a cautionary reminder that memory accesses are not the only factors that determine performance, and that within the class of cache-based systems, significant differences exist.

Author

Microprocessors; Supercomputers; Optimization; Applications Programs (Computers); Memory (Computers)

20020045344 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

V and V of Advanced Systems at NASA

Pecheur, Charles, Research Inst. for Advanced Computer Science, USA; Nelson, Stacy, Computer Sciences Corp., USA; April 2002; 78p; In English

Contract(s)/Grant(s): NRA-8-30/TA-5/Northrop-Grumman

Report No.(s): NASA/CR-2002-211401; NAS 1.26:211401; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this report is to provide the following: 1) Overview of Formal Methods beneficial to Verification and Validation (V&V) of 2nd Generation Re-usable Launch Vehicle Integrated Vehicle Health Management (RLV IVHM); 2) Description of current use of Formal Methods at NASA and their applicability to 2nd Generation RLV IVHM software; and 3) Guide for incorporation Formal Methods into NASA V&V Standards for certification of airborne software like 2nd Generation RLV IVHM.

Author

NASA Programs; Reusable Launch Vehicles; Program Verification (Computers); Software Engineering

20020045346 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

New V and V Tools for Diagnostic Modeling Environment (DME)

Pecheur, Charles, Research Inst. for Advanced Computer Science, USA; Nelson, Stacy, Computer Sciences Corp., USA; April

2002; 42p; In English

Contract(s)/Grant(s): NRA-8-30/TA-5-Northrup-Grumman

Report No.(s): NASA/CR-2002-211403; NAS 1.26:211403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The purpose of this report is to provide correctness and reliability criteria for verification and validation (V&V) of Second Generation Reusable Launch Vehicle (RLV) Diagnostic Modeling Environment, describe current NASA Ames Research Center tools for V&V of Model Based Reasoning systems, and discuss the applicability of Advanced V&V to DME. This report is divided into the following three sections: (1) correctness and reliability criteria; (2) tools for V&V of Model Based Reasoning; and (3) advanced V&V applicable to DME. The Executive Summary includes an overview of the main points from each section. Supporting details, diagrams, figures, and other information are included in subsequent sections. A glossary, acronym list, appendices, and references are included at the end of this report.

Author

Reliability Analysis; Reusable Launch Vehicles; Software Development Tools

20020045358 NASA Ames Research Center, Moffett Field, CA USA

Multiobjective Optimization Using a Pareto Differential Evolution Approach

Madavan, Nateri K., NASA Ames Research Center, USA; [2002]; 6p; In English; 2002 Congress on Evolutionary Computation, 12-17 May 2002, Honolulu, HI, USA

Contract(s)/Grant(s): RTOP 704-40-21; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   Differential Evolution is a simple, fast, and robust evolutionary algorithm that has proven effective in determining the global optimum for several difficult single-objective optimization problems. In this paper, the Differential Evolution algorithm is extended to multiobjective optimization problems by using a Pareto-based approach. The algorithm performs well when applied to several test optimization problems from the literature.

Author

Algorithms; Optimization

20020045377 Aerospace Corp., El Segundo, CA USA

Object-Oriented Metrics

Abelson, L. A.; Jan. 20, 2002; 92p; In English

Contract(s)/Grant(s): F04701-00-C-0009

Report No.(s): AD-A400493; TR-2002(8550)-1; SMC-TR-02-13; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

   The application of object-oriented methodology and an evolutionary approach to the development of software-intensive systems introduces some unique acquisition management challenges. This report discusses the unique challenges of using metrics to monitor software developed using object-oriented techniques and evolutionary development lifecycle. Topics addressed include the definition of 31 specific metrics that may be used for monitoring object-oriented design and development. In addition, this report provides guidance on which metrics would be useful during the process of transitioning to the object technology.

DTIC

Object-Oriented Programming; Software Engineering

20020045439 NASA Goddard Space Flight Center, Greenbelt, MD USA

Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems

Kobler, Benjamin, Editor, NASA Goddard Space Flight Center, USA; Hariharan, P. C., Editor, Systems Engineering and Security, Inc., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies; April 2002; 344p; In English; Tenth Goddard Conference on Mass Storage Systems and Technologies, 15-18 Apr. 2002, College Park, MD, College Park, MD, USA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Also announced as 20020045440 through 20020045466

Report No.(s): NASA/CP-2002-210000; NAS 1.55:210000; Rept-000133; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

   This document contains copies of those technical papers received in time for publication prior to the Tenth Goddard Conference on Mass Storage Systems and Technologies which is being held in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems at the University of Maryland University College Inn and Conference Center April 15-18, 2002. As one of an ongoing series, this Conference continues to provide a forum for discussion of issues relevant to the ingest, storage, and management of large volumes of data. The Conference encourages all interested organizations to discuss long-term mass storage requirements and experiences in fielding solutions. Emphasis is on current and future practical solutions addressing issues in data management, storage systems and media, data acquisition, long-term retention of data, and data distribution. This year's

discussion topics include architecture, future of current technology, storage networking with emphasis on IP storage, performance, standards, site reports, and vendor solutions. Tutorials will be available on perpendicular magnetic recording, object based storage, storage virtualization and IP storage.

Author

Conferences; Data Acquisition; Data Management; Magnetic Recording

20020045442 International Business Machines Corp., Almaden Research Center, San Jose, CA USA

IP Storage: The Challenge Ahead

Sarkar, Prasenjit, International Business Machines Corp., USA; Voruganti, Kaladhar, International Business Machines Corp., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 35-42; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Advanced networking technology has led to the genesis of the storage area network model, where host servers can access storage as a service from various devices connected to the network. While the initial approach to storage area networks has involved specialized networking technology, the emergence of Gigabit Ethernet technology has raised the question of whether we can use commodity IP networks for storage. This paper examines the issues involving IP storage networks and presents a performance analysis to dispel some of the myths and outline some of the challenges.

Author

Ethernet; Computer Storage Devices

20020045443 CalSoft Private Ltd., Pune, India

File Virtualization with DirectNFS

Bhide, Anupam, CalSoft Private Ltd., India; Engineer, Anu, CalSoft Private Ltd., India; Kanetkar, Anshuman, CalSoft Private Ltd., India; Kini, Aditya, CalSoft Private Ltd., India; Karamanolis, Christos, Hewlett-Packard Labs., USA; Muntz, Dan, Hewlett-Packard Labs., USA; Zhang, Zheng, Hewlett-Packard Labs., USA; Thunquest, Gary, Hewlett-Packard Co., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 43-57; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

There is a definite trend in the enterprise storage industry to move from Network Attached Storage (NAS) solutions to high performance Storage Area Networks (SAN). This transition is not easy because of the well-entrenched NAS infrastructure that has already been deployed. This paper attempts to define a file system that can leverage the existing NAS software infrastructure along with evolving SAN technology to provide the benefits of high performance storage access while reducing the cost of migrating to these networks. In this paper, we propose a new network file system, DirectNFS, which allows NAS clients to take full advantage of the performance and scalability benefits of SANs. In order to achieve this goal, the system presents a NAS interface to existing NAS clients while allowing DirectNFS clients to access storage directly over shared SAN, i.e. clients bypass the server for data access. A server maintains the NAS interface for legacy clients and arbitrates access to metadata by DirectNFS (SAN aware) clients. This metadata server ensures that the system is operable for both legacy NAS clients as well as DirectNFS clients. The communication protocol of DirectNFS is designed as an extension of traditional network file systems protocols, such as NFS and CIFS. A prototype of DirectNFS has been built for Linux, as an extension to the native NFSv2 implementation. Initial results demonstrate that the performance of data intensive operations such as read and write is comparable to that of local file systems, such as ext2.

Author

Data Processing; Data Management; Networks; Computer Storage Devices

20020045444 Hewlett-Packard Co., Palo Alto, CA USA

Building a Single Distributed File System from Many NFS Servers -or- The Poor-Man's Cluster Server

Muntz, Dan, Hewlett-Packard Co., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 59-64; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this paper, we describe an architecture, NFS^2, for uniting several NFS servers under a single namespace. This architecture has some interesting properties. First, the physical file systems that make up an NFS^2 instance, i.e., the file systems on the individual NFS servers, may be heterogeneous. This, combined with the way the NFS^2 namespace is constructed, allows files of different types (text, video, etc.) to be served from file servers (potentially) optimized for each type. Second, NFS^2 storage is strictly partitioned-each NFS server is solely responsible for allocating the resources under its control. This eliminates resource

contention and distributed lock management, commonly found in cluster file systems. Third, because the system may be constructed with standard NFS servers, it can benefit from existing high-availability solutions for individual nodes, and performance improves as NFS servers improve. Last, but not least, the system is extremely easy to manage-new resources may be added to a configuration by simply switching on a new server, which is then seamlessly integrated into the cluster. An extended version of this architecture is the basis for a completed prototype in Linux ..

Author

Prototypes; Heterogeneity; Computer Storage Devices

20020045445 Storage Technology Corp., Louisville, CO USA

High Performance RAIT

Hughes, James, Storage Technology Corp., USA; Milligan, Charles, Storage Technology Corp., USA; Debiez, Jacques, Storage Technology Corp., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 65-73; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The ability to move 10s of TeraBytes of data in reasonable amounts of time are critical to many mass storage applications. This paper examines the issues of high performance, high reliability tape storage systems, and presents the results of a 2-year ASCI Path Forward program to be able to reliably move 1 GB/s to an archive that can last 20 years. This paper will cover the requirements, approach, hardware, application software, interface descriptions, performance, measured reliability and predicted reliability. This paper will also touch on future directions for this research. The current research allows systems to sustain 80MB/s of incompressible data per Fibre Channel interface which is striped out to 8 or more drives. A RAIT system looks to the application as if it were a single tape drive from both mount and data transfer. Striping 12 RAIT systems together will provide nearly 1 GB/s to tape. The reliability is provided by a method of adding parity tapes to the data stripes. For example, adding 2 parity tapes to an 8-stripe group will allow any 2 of the 10 tapes to be lost or damaged without loss of information. An interesting result of this research is that the reliability of RAIT with 8 stripes and 2 parities exceeds that of mirrored tapes even though 8 mirrored tapes requires 16 actual tapes and 8 data tapes plus 2 parity tapes only requires 10 actual tapes.

Author

Data Processing; Data Transfer (Computers); Computer Storage Devices; Channels (Data Transmission)

20020045446 NASA Goddard Space Flight Center, Greenbelt, MD USA

Conceptual Study of Intelligent Data Archives of the Future

Ramapriyan, H. K., NASA Goddard Space Flight Center, USA; Kempler, Steve, NASA Goddard Space Flight Center, USA; Lynnes, Chris, NASA Goddard Space Flight Center, USA; McConaughy, Gail, NASA Goddard Space Flight Center, USA; McDonald, Ken, NASA Goddard Space Flight Center, USA; Kiang, Richard, NASA Goddard Space Flight Center, USA; Calvo, Sherri, Global Science and Technology, Inc., USA; Harberts, Robert, Global Science and Technology, Inc., USA; Roelofs, Larry, Global Science and Technology, Inc., USA; Sun, Donglian, George Mason Univ., USA; Clemence, Lara, Editor, Global Science and Technology, Inc., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 75-91; In English; Also announced as 20020045439; This study was funded by the Intelligent Data Understanding area of NASA's Intellegent Systems Program; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A conceptual architecture study is under way to address the problem of getting the most scientific value from the large volumes of Earth and space science data that NASA expects to accumulate in the future. This involves efficient storage and access, but goes beyond that to facilitate intelligent data understanding and utilization through modeling realistic virtual entities with predictive capabilities. The objective of the study is to formulate ideas and concepts and to provide recommendations that lead to prototyping and implementation in the period from 2010 to 2020. The approach consists of the definition of future scenarios and needs for data usage in applications (in consultation with scientific and applications users), projection of advances in technologies, and an abstraction of an intelligent archive architecture. Strategic evolution is considered in various areas such as storage, data, information and knowledge management, data ingest and mining, user interfaces, and advances in intelligent data understanding algorithms.

Author

Algorithms; Predictions; Computer Storage Devices

20020045447 National Center for Supercomputing Applications, Champaign, IL USA

Storage Issues at NCSA: How to Get File Systems Going Wide and Fast Within and Out of Large Scale Linux Cluster Systems

Butler, Michelle L., National Center for Supercomputing Applications, USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 93-108; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper will discuss the history of storage at the National Center for Supercomputer Applications (NCSA) over the last fifteen years from inception to a four hundred terabyte archive. The paper discusses supercomputing requirements, hardware and software configurations, and the evolution of data management at NCSA. This paper also discusses the strengths and weaknesses of NCSA's different storage strategies, and gives a detailed discussion of the current system and how it is being evolved to meet the requirements of the TeraGrid computing systems, and large-scale Linux clusters.

Author

Computer Programs; Computer Storage Devices; Data Management

20020045448 Storage Technology Corp., Louisville, CO USA

The Challenges of Magnetic Recording on Tape for Data Storage (The One Terabyte Cartridge and Beyond)

Dee, Richard H., Storage Technology Corp., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 109-119; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Operating points to achieve Terabyte tape cartridge capacities and beyond drive both linear and track densities to values not perceived possible a few short years ago. The primary contributors to the issues related to these high capacities are the physical and magnetic properties of the tape media itself. The total magnetic moment of the recorded bit, driven by the magnetic coating thickness, dominates the recording process and determines the linear recording density possible. Moving a thin tape at high speeds and the mechanical stability in the cross track direction provide engineering challenges for increasing track densities in combination with many parallel channels for high data rates. These issues and trade offs are the main focus of this paper.

Author

Magnetic Recording; Stability; Computer Storage Devices

20020045449 Minnesota Univ., Dept. of Computer Science and Engineering, Minneapolis, MN USA

Efficient RAID Disk Scheduling on Smart Disks

Chang, Tai-Sheng, Minnesota Univ., USA; Du, David H. C., Minnesota Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 121-135; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

With the emerging high-performance storage systems as well as the availability of faster processors and high-speed networks, many applications that were only dreams a few years ago, have become reality. For example, Digital Libraries and Digital Medical Imaging Archive Systems have become available today. Many of these new applications are making great impacts on the way we work and the way we live. Among the supporting technologies, a high-performance storage system is one of the most critical factors in these systems. RAID (Redundant Array of Independent Disks) has been playing a very important role in supporting high performance storage systems. It exists in storage systems ranging from one with a couple disks to those with several terabytes capacity. RAID uses data striping and parity information to provide higher I/O throughput on large data access and fault tolerance against disk failure. The implementation of RAID systems can be categorized into two different groups. The first category is the hardware RAID that uses additional RAID controllers to manage and process most of the required tasks in a RAID system. Those tasks include data parity computation and volume management. The other category of RAID uses the existing CPU(s) and memory on the system instead for all the necessary tasks (as opposed to the hardware RAID solution, we call it software RAID). From a user's point of view, hardware RAID solutions require RAID controllers and increase the costs of a system; On the other hand, Software RAID solutions consume CPU and memory resource when performing RAID operations. Therefore, the applications running on the same hosts where the software RAID resides will suffer performance degradation. Fortunately, there is a new technology that provides an alternative solution between the expensive Hardware RAID solutions and the poorer performing Software RAID solutions. This new technology is called Disk-Based XOR. Disk-Based XOR is a technology utilizing the capability of computation on disks. by calculating the XOR results on disks, the CPU resource is no longer required for the computation-intensive XOR computation in RAID systems. Another big advantage of the Disk-Based XOR approaches is that the data amount needs to be transferred on storage channel can be greatly reduced by as much as 50%.

Derived from text

Disk Operating System (DOS); Computer Storage Devices; Memory (Computers)

20020045450 Johns Hopkins Univ., Dept. of Computer Science, USA

Experimentally Evaluating In-Place Delta Reconstruction

Burns, Randal, Johns Hopkins Univ., USA; Stockmeyer, Larry, International Business Machines Corp., USA; Long, Darrell D. E., California Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 137-151; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In-place reconstruction of delta compressed data allows information on devices with limited storage capability to be updated efficiently over low-bandwidth channels. Delta compression encodes a version of data compactly as a small set of changes from a previous version. Transmitting updates to data as delta versions saves both time and bandwidth. In-place reconstruction rebuilds the new version of the data in the storage or memory space the current version occupies - no additional scratch space is needed. by combining these technologies, we support large-scale, highly-mobile applications on inexpensive hardware. We present an experimental study of in-place reconstruction algorithms. We take a data-driven approach to determine important performance features, classifying files distributed on the Internet based on their in-place properties, and exploring the scaling relationship between files and data structures used by in-place algorithms. We conclude that in-place algorithms are I/O bound and that the performance of algorithms is most sensitive to the size of inputs and outputs, rather than asymptotic bounds.
Author

Experimentation; Evaluation; Data Compression; Data Storage; Transmission; Computer Storage Devices

20020045451 California Univ., Jack Baskin School of Engineering, Santa Cruz, CA USA

Intra-File Security for a Distributed File System

Banachowski, Scott A., California Univ., USA; Peterson, Zachary N. J., California Univ., USA; Miller, Ethan L., California Univ., USA; Brandt, Scott A., California Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 153-163; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Cryptographic file systems typically provide security by encrypting entire files or directories. This has the advantage of simplicity, but does not allow for fine-grained protection of data within very large files. This is not an issue in most general-purpose systems, but can be very important in scientific applications where some but not all of the output data is sensitive or classified. We present a more flexible approach that uses common Cryptographic techniques to secure any arbitrary-sized region of data within a file, even if the region is logically non-contiguous. This approach, called intra-file encryption, allows mixing data of different sensitivity in a single file. This benefits users by permitting related data belonging to a single file to be kept together rather than separating data of different security needs. Supporting intra-file encryption requires additional file metadata and key management services. For file systems that store metadata and files on the same server, the management of extra metadata poses little problem beyond storage overhead. However, for high-performance network-attached file systems, the additional metadata poses greater challenges related to data placement and security. This paper describes the intra-file security encryption technique with discussion of including support for it in a distributed file system.
Author

Computer Information Security; Cryptography; Data Management

20020045452 Rutgers Univ., MSIS Dept., Newark, NJ USA

Efficient Storage and Management of Environmental Information

Adam, Nabil R., Rutgers Univ., USA; Atluri, Vijayalakshmi, Rutgers Univ., USA; Yu, Songmei, Rutgers Univ., USA; Yesha, Yelena, Maryland Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 165-179; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Spatial Data warehouses pose many challenging requirements with respect to the design of the data model due to the nature of analytical operations and the nature of the views to be maintained by the spatial warehouse. The first challenge is due to the multi dimensional nature of each dimension itself. In a traditional data warehouse the various dimensions contributing to the warehouse data are simple in nature, each having different attributes. Data models such as the star schema, fact constellation schema, snowflake schema or the multi-dimensional model, can therefore, be used to represent the traditional data warehouse. On the other hand, the different dimensions in a spatial data warehouse comprise of different types of data, each of which is multidimensional in nature. The current available data models are not adequate for such domains. In this paper, we propose a data model that is well suited for such domains, called the cascaded star model that is capable of representing multiple dimensions of a spatial data warehouse, where each dimension is multidimensional, The nature of the queries in such domains is different from

that of traditional data warehouses (such as fly-by of a region), and therefore we propose a suitable architecture that allows specification of the queries and their visual presentation.

Author

Computer Storage Devices; Data Bases; Effectiveness

20020045454 Purdue Univ., Dept. of Computer Sciences, West Lafayette, IN USA

Data Placement for Tertiary Storage

Li, Jiangtao, Purdue Univ., USA; Prabhakar, Sunil, Purdue Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 193-207; In English; Also announced as 20020045439

Contract(s)/Grant(s): NSF IIS-99-85019; NSF CCR-99-88339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this paper we address the important problem of data placement in tertiary storage taking object relationships into account. This work is in contrast to earlier schemes that either focus on specific data types or assume that data objects are accessed independently. Five new data placement schemes are developed. The effectiveness of these schemes is shown through simulation. The proposed schemes, in particular the Edge Merge scheme, give superior performance over schemes optimized for independent access. We also show that our schemes can easily adapt to variations in the access pattern. This also allows the schemes to be employed when no prior information about the access pattern is available. Interestingly, our results show that the probabilities of object access do not have a big impact on performance. On the other hand, changes to the clustering of nodes have a significant effect. This result underscores the importance of the relationships between objects for placement of data. The use of controlled replication for "free" is also developed and shown to be effective in further improving performance. The study also evaluates the impact of a secondary disk layer and prefetching.

Author

Data Storage; Computer Programs

20020045455 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Storage Resource Managers: Middleware Components for Grid Storage

Shoshani, Arie, California Univ., Lawrence Berkeley National Lab., USA; Sim, Alex, California Univ., Lawrence Berkeley National Lab., USA; Gu, Junmin, California Univ., Lawrence Berkeley National Lab., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 209-223; In English; Also announced as 20020045439

Contract(s)/Grant(s): DE-AC03-76SF-00098; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The amount of scientific data generated by simulations or collected from large scale experiments have reached levels that cannot be stored in the researcher's workstation or even in his/her local computer center. Such data are vital to large scientific collaborations dispersed over wide-area networks. In the past, the concept of a Grid infrastructure mainly emphasized the computational aspect of supporting large distributed computational tasks, and managing the sharing of the network bandwidth by using bandwidth reservation techniques. In this paper we discuss the concept of Storage Resource Managers (SRMs) as components that complement this with the support for the storage management of large distributed datasets. The access to data is becoming the main bottleneck in such "data intensive" applications because the data cannot be replicated in all sites. SRMs are designed to dynamically optimize the use of storage resources to help unclog this bottleneck.

Author

Computer Storage Devices; Data Management; Data Simulation

20020045456 International Business Machines Corp., Houston, TX USA

Storage Area Networks and the High Performance Storage System

Hulen, Harry, International Business Machines Corp., USA; Graf, Otis, International Business Machines Corp., USA; Fitzgerald, Keith, Lawrence Livermore National Lab., USA; Watson, Richard W., Lawrence Livermore National Lab., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 225-240; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The High Performance Storage System (HPSS) is a mature Hierarchical Storage Management (HSM) system that was developed around a network-centered architecture, with client access to storage provided through third-party controls. Because of this design, HPSS is able to leverage today's Storage Area Network (SAN) infrastructures to provide cost effective, large-scale storage systems and high performance global file access for clients. Key attributes of SAN file systems are found in HPSS today, and more complete SAN file system capabilities are being added. This paper traces the HPSS storage network architecture from

the original implementation using HIPPI and IPI-3 technology, through today's local area network (LAN) capabilities, and to SAN file system capabilities now in development. At each stage, HPSS capabilities are compared with capabilities generally accepted today as characteristic of storage area networks and SAN file systems.
Author
Computer Storage Devices; Local Area Networks; Management Systems

20020045457 National Univ. of Singapore, MCSA Group, Singapore
Introducing a Flexible Data Transport Protocol for Network Storage Applications
Khoo, Patrick Beng T., National Univ. of Singapore, Singapore; Wang, Wilson Yong H., National Univ. of Singapore, Singapore; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 241-257; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

   The purpose of this paper is to demonstrate that alternative solutions to current methods exist for network storage. We would like to introduce one such alternative, a new protocol that we call HyperSCSI. This protocol is used for the transmission of Small Computer Systems Interface (SCSI) family of protocols across a network and multi-technology device support. In this paper, we will outline some of the key features and basic technical details of HyperSCSI. We have also developed several fully functioning disk array prototypes using a variety of hardware and storage devices as well as conducted benchmarks and performance tests on this. A performance comparison between this new protocol and iSCSI and NFS is also included here.
Author
Protocol (Computers); Performance Tests; Data Processing

20020045458 International Business Machines Corp., Haifa Research Lab., Haifa, Israel
Point-in-Time Copy: Yesterday, Today and Tomorrow
Azagury, Alain, International Business Machines Corp., Israel; Factor, Michael E., International Business Machines Corp., Israel; Satran, Julian, International Business Machines Corp., Israel; Micka, William, International Business Machines Corp., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 259-270; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

   Making copies of large sets of data is a common activity. These copies can provide a consistent image for a backup, a checkpoint for restoring the state of an application, a source for data mining, real data to test a new version of an application, and so on. One characteristic all of these uses have in common is that it is important that the copy appear to occur atomically, i.e., any updates to the data source being copied either occur before or after the copy. In this work, we examine the history, the state-of-the-art, and possible future of mechanisms for copying large quantities of data via storage subsystem facilities for providing point-in-time (PiT) copies.
Author
Reproduction (Copying); Computer Storage Devices

20020045459 Hewlett-Packard Co., Palo Alto, CA USA
Locating Logical Volumes in Large-Scale Networks
Mahalingam, Mallik, Hewlett-Packard Co., USA; Karamanolis, Christos, Hewlett-Packard Co., USA; Karlsson, Magnus, Hewlett-Packard Co., USA; Xu, Zhichen, Hewlett-Packard Co., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 271-283; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

   Storage is increasingly becoming a commodity shared in global scale, either within the infrastructure of large organizations or by outsourcing to Storage Service Providers. Storage resources are managed and shared in the form of logical volumes; that is, virtual disks that aggregate resources from multiple, distributed physical devices and storage area networks. Logical volumes are dynamically assigned to servers according to a global resource utility model. This paper focuses on the problem of locating and accessing logical volumes in very large scale. Our goal is to devise mechanisms that are least intrusive to the existing Internet infrastructure. Two methods are proposed, based on DNS name resolution and BGP routing, respectively. The former is based on the current DNS protocols and infrastructure; the latter requires extensions to the existing BGP protocols. The two approaches are evaluated by means of simulations, based on realistic workloads and actual Internet topology. It is shown that the simpler and less intrusive DNS-based approach performs sufficiently well, for even small caches on the clients.
Author
Internets; Protocol (Computers); Computer Storage Devices; Networks

20020045460 Indiana Univ., University Information Technology Services, Bloomington, IN USA

Building a Massive, Distributed Storage Infrastructure at Indiana University

Shankar, Anurag, Indiana Univ., USA; Bernbom, Gerry, Indiana Univ., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 285-289; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

   Anticipating an onslaught of data in research, administrative, and academic computing, Indiana University (IU) undertook in 1998 the ambitious task of architecting a massive, distributed storage infrastructure to meet its long-term storage needs. The task, now nearly complete, has resulted in the institution of the High Performance Storage System (HPSS), a hierarchical storage management (HSM) system, augmented by the Distributed Computing Environment Distributed File System (DCE DFS) acting both as a file system front end to HPSS and as a common file system (CFS) for IU campuses. Using gateways, IU's distributed storage system today currently offers a user on its eight geographically distributed campuses a capacity for securely storing and accessing nearly 200 Terabytes of data from any networked (Windows, Mae, or UNIX/Linux) desktop equipped with a web browser. HSM systems such as HPSS have traditionally been used by high-end users at large research labs (for example Los Alamos, Livermore, Sandia, Brookhaven National Labs in the U.S. and at CERN in Europe), at supercomputer centers (for example the San Diego Supercomputer Center), and at government agencies such as NASA. IU's installation is unique in two respects. It is the first production HPSS that is geographically distributed over a wide area network (WAN). Second, we have made available a high-end storage system in an academic setting not only to traditional, high-performance research users (for example astronomers, physicists, chemists, etc.), but also more generally (to users in economics, fine arts, apparel design, music, libraries, life sciences, etc.).
Author

Computer Storage Devices; Management Systems; UNIX (Operating System); Wide Area Networks

20020045461 MetroLaser, Irvine, CA USA

High-density Holographic Data Storage with Random Encoded Reference Beam

Markov, Vladimir B., MetroLaser, USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 291-295; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

   Holographic technique offers high-density data storage with parallel access and high throughput. Several methods exist for data multiplexing based on the fundamental principle of volume hologram Bragg selectivity. We recently demonstrated that spatial shift selectivity associated with a random (amplitude-phase) encoding of the reference beam is an alternative method for high-density, high capacity data multiplexing. In this report we show some characteristics of the random encoded reference beam hologram selectivity.
Author

Data Storage; Holography; Computer Storage Devices

20020045462 International Business Machines Corp., Haifa Research Lab., Haifa, Israel

iSCSI Initiator Design and Implementation Experience

Meth, Kalman Z., International Business Machines Corp., Israel; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 297-303; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

   The iSCSI protocol provides access to SCSI devices over a TCP transport. Using the iSCSI protocol enables one to build a Storage Area Network using standard Ethernet infrastructure and standard networking management tools. This paper outlines how we implemented a family of iSCSI initiators on a common core. The initially supported initiators were on the Windows NT and the Linux Operating Systems. Code for a version of the Linux iSCS1 initiator has been released as Open Source. Initial testing indicates that iSCSI can provide reasonable performance relative to traditional storage environments.
Author

Protocol (Computers); Computer Storage Devices; Networks

20020045463 Tsinghua Univ., Dept. of Computer Science and Technology, Bejing, China

Efficiently Scheduling Tape-resident Jobs

Shi, Jing, Tsinghua Univ., China; Xing, Chunxiao, Tsinghua Univ., China; Zhou, Lizhu, Tsinghua Univ., China; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 305-309; In English; Also announced as 20020045439

Contract(s)/Grant(s): G1999032704; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Many large-scale data-intensive applications need to use tape library to manage large data sets, thus it is critical to study the online access techniques of tape library. The focus of this paper is on efficient tape-resident jobs scheduling, which is the key technique for improving performance of tape storage systems. We present several scheduling algorithms for tape-resident jobs, discuss the effectiveness of scheduling policies under cache-limited and cache-unlimited condition, and show the results of simulation experiments.

Author

Computer Storage Devices; Libraries; Scheduling

20020045464 Fuji Photo Film Co. Ltd., Recording Media Products Div., Odawara, Japan

The Storage Stability of Metal Particle Media: Chemical Analysis and Kinetics of Lubricant and Binder Hydrolysis

Hanai, Kazuko, Fuji Photo Film Co. Ltd., Japan; Kakuishi, Yutaka, Fuji Photo Film Co. Ltd., Japan; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 311-315; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Archival life of MP (metal particles) tape is one of the biggest concerns for mass data storage users. The long-term stability of an MP tape is studied in terms of lubricant and binder systems. MP formulation tape that has been used for M2 videotape and DLT3 tape for more than fourteen years is analyzed. Gas chromatography (GC) and gel permeation chromatography (GPC) are used to analyze chemical changes of lubricant, fatty acid ester, and binder, polyester-polyurethane. The kinetics of hydrolysis of the fatty acid ester can be described by two first-order reactions. One is estimated to be corresponding to the hydrolysis of fatty acid ester on the surface of the magnetic layer, and the other to the fatty acid ester dissolved in the binder of magnetic layer. The hydrolysis of polyester-polyurethane (PU) can also be described by a first-order reaction. A durability test reveals that this MP tape keeps its good performance after long-term storage. A magnetization decrease of about twelve percent is observed after saving for fourteen years. This small decrease does not affect the above mentioned good performance.

Author

Chemical Analysis; Gas Chromatography; Liquid Chromatography; Magnetization; Metal Particles; Storage Stability; Video Tapes

20020045465 Mueller (Gary), Broomfield, CO USA

Java and Real Time Storage Applications

Mueller, Gary, Mueller (Gary), USA; Borzuchowski, Janet, Storage Technology Corp., USA; Tenth Goddard Conference on Mass Storage Systems and Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 317-326; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Storage systems have storage devices which run real time embedded software. Most storage devices use C and occasionally C++ to manage and control the storage device. Software for the storage device must meet the time and resource constraints of the storage device. The prevailing wisdom in the embedded world is that objects and in particular Java only work for simple problems and can not handle REAL problems, are too slow and can not handle time critical processing and are too big and can't fit in memory constrained systems. Even though Java's roots are in the embedded application area, Java is more widely used in the desktop and enterprise environment. Use of Java in embedded real time environments where performance and size constraints rule is much less common. Java vendors offer a dizzying array of options, products and choices for real time storage applications. Four main themes emerge when using Java in a real time storage application; compiling Java, executing Java with a software Java Virtual Machine (JVM), executing Java with a hardware JVM and replacing a real time operating system (RTOS) with a JVM. The desktop and enterprise environment traditionally run Java using a software JVM that has been ported to a particular platform. The JVM runs as a task or process hosted by the platform operating system. With the performance and memory available on most workstations and personal computers, running an application on a software JVM is not an issue. However, many desktop and enterprise applications are not faced with the critical time and space constraints of an embedded application. Because of these constraints, running an embedded application on a software JVM incurs the additional overhead of software running software. Although it might be possible to run some embedded applications on a software JVM because of the tremendous speed of some processors, for most embedded applications, this configuration will not met timing or space constraints.

Derived from text

Applications Programs (Computers); Computer Programs; Computer Storage Devices; Java (Programming Language)

20020045466 Sony Broadband Solutions Network Co., ATSugi, Japan

DIR-2000, 1 Gbit/sec Data Recorder for VERA Project

Sasanuma, Tony, Sony Broadband Solutions Network Co., Japan; Tenth Goddard Conference on Mass Storage Systems and

Technologies in cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 327-330; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

This paper will discuss the new technologies used in the DIR-2000, 1 Gbit/sec data recorder: the highest performance in the commercial market. It will briefly explain how the DIR-2000 is implemented in VERA Program of National Astronomical Observatory in Japan.
Author

Data Recorders; Computer Storage Devices; Technology Assessment

20020045486 Stanford Univ., Dept. of Computer Science, Stanford, CA USA
Hardware Verification Integrating Deductive with Algorithmic Technologies *Final Report, 1 Oct. 1996-31 Mar. 2001*
Manna, Zohar; Apr. 14, 2002; 12p; In English
Contract(s)/Grant(s): DABT63-96-C-0096
Report No.(s): AD-A400799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The work supported under this grant can be divided into four closely related areas: (1) Verification of real-time and hybrid systems; (2) Static analysis; (3) Automata-based deductive verification of real-time systems; and (4) Abstraction and modularity in deductive verification. The results obtained in these areas have been reported in conference and journal papers referenced in the report. Most of the methods developed have been implemented and evaluated for their utility in the framework of the Stanford Temporal Prover (STeP).
DTIC

Algorithms; Real Time Operation; Program Verification (Computers)

20020045515 BBNT Solutions, LLC, Cambridge, MA USA
Agent-Based Configurable Testbed *Final Report, Mar. 2000-Dec. 2001*
Lazarus, Richard; Feb. 2002; 53p; In English; Original contains color images
Contract(s)/Grant(s): F30602-00-C-0082; AF Proj. IAST
Report No.(s): AD-A400611; AFRL-IF-RS-TR-2002-7; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The ABC Testbed Project spanned the period from April 2000 to December 2001. The project began as part of the DARPA Information Assurance and Survivability (IA&S) program and concluded as part of the DARPA Ultra*Log program. The project focus was to contribute experimentation methodologies and software tools for the understanding of composed, distributed systems with a particular emphasis on enhancing survivability of these systems. The idea was to capture the state of developing system and to visualize this system state in such a manner that it provides intuitive understanding of the system behavior. The ABC project culminated with the development of the Cougaar Society Monitoring and Analysis Reporting Tool (CSMART). Cougaar is a large-scale distributed agent application with minimal consideration for the underlying architecture infrastructure. CSMART is an integrated toolset for building, running, monitoring, and analyzing Cougaar societies, and for performing experiments on those societies by systematically carrying their properties and comparing the resulting behaviors.
DTIC

Software Development Tools; Test Stands

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20020044547 Smithsonian Astrophysical Observatory, Cambridge, MA USA
High-Resolution Spectroscopic Database for the NASA Earth Observing System Program *Annual Report, 1 May 2001 - 30 Apr. 2002*
Rothman, Laurence S., Smithsonian Astrophysical Observatory, USA; March 2002; 16p; In English
Contract(s)/Grant(s): NAG5-8420; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this project is to develop and enhance the HITRAN molecular spectroscopic database and associated software to support the observational programs of the Earth Observing System (EOS). In particular, the focus is on the EOS projects: the Atmospheric Infrared Sounder (AIRS), the High-Resolution Dynamics Limb Sounder (HIRDLS), Measurements of Pollution in the Troposphere (MOPITT), the Tropospheric Emission Spectrometer (TES), and the Stratospheric Aerosol and Gas Experiment (SAGE III). The data requirements of these programs in terms of spectroscopy are varied, but usually call for additional spectral

parameters or improvements to existing molecular bands. In addition, cross-section data for heavier molecular species must be expanded and made amenable to modeling in remote sensing. The effort in the project also includes developing software and distribution to make access, manipulation, and use of HITRAN functional to the EOS program.
Author
Data Bases; Spectroscopy; Computer Programs; Atmospheric Chemistry; Spectrum Analysis

20020045352 BDM Federal, Inc., USA
Report Identifying Changes in Data and Newly-Identified Sources *Final Report, Oct. 1993-Jun. 1994*
Keesling, J. W.; May 1995; 8p; In English
Contract(s)/Grant(s): MDA903-92-D-0075
Report No.(s): AD-A400474; ARI-CR-2002-18; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   This report documents the changes that occurred during the first three quarters of FY1994 in the content and format of the data provided by the Combat Training Centers (CTCs) to the Combat Training Center Archive at the Presidio of Monterey. Each of the CTCs is discussed in turn.
DTIC
Combat; Education; Military Technology

20020045508 Department of Energy, Office of Inspections, Washington, DC USA
Inspection of the Department of Energy's Automated Export Control System
Dec. 2001; 28p; In English; Original contains color images
Report No.(s): AD-A400757; DOE/IG-0533; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The export of commodities and technologies by the USA is encouraged by both the private sector and the Federal Government. These exports help to improve our position in the global economy and are in the national interest of the country. However, exports of commodities and technologies, without regard to whether they may significantly contribute to the military potential of individual countries or combination of countries or enhance the proliferation of weapons of mass destruction, may adversely affect the national security of the USA. The Federal Government, therefore, implements several laws, Executive Orders, and regulations to control the export of certain commodities and technologies, which require a license for export. The license applications are processed and tracked by numerous Federal agencies through various automated databases. Collectively, these databases are intended to enable an appropriate level of review and coordination for exports of these commodities and technologies.
DTIC
Commodities; International Trade; Data Bases

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20020044108 Georgia Tech Research Inst., Atlanta, GA USA
Sensor Fusion and Image Interpretation Through Integrated Spatial/Spectral Pattern Recognition
Higgins, Melinda K.; Doll, Theodore J.; Faust, Nick L.; Wasilewski, Anthony A.; Jun. 2000; 21p; In English; Original contains color images
Report No.(s): AD-A400210; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Typical multispectral/hyperspectral image (MSI/HSI) data analysis focuses on single pixel-at-a-time analysis and pattern matching to known or trained spectral signatures. Nearest neighbor and object feature classification techniques are not fully exploited through traditional MSI/HSI approaches. Inputs from multiple sensors of varying formats, spectral resolution, and spatial resolution are only beginning to be fused together.
DTIC
Multisensor Fusion; Pattern Recognition; Spectral Resolution; Image Processing

Includes iteration, differential and difference equations, and numerical approximation.

20020044433 Boeing Co., Boeing Military Aircraft and Missile Systems Group, Seattle, WA USA

A Comparative Analysis of Evidential Reasoning and Cumulative Scoring Algorithms in the Context of a Combat Identification Application

Mahalanabis, A.; Lobbia, R. N.; Willman, C. R.; Jun. 2000; 19p; In English; Original contains color images

Report No.(s): AD-A400211; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Within the discipline of Combat ID, as related to high performance fighters, a problem of significant proportion that arises is how to determine quickly and accurately a target's ID. Various algorithms, many of which are proprietary, that address this problem have been developed over the last decade. But their robustness in handling a new and unforeseen target threat environment leaves much to be desired. In this paper we explore two candidate classes of algorithms for achieving this objective, namely, an evidential reasoning and a cumulative scoring technique. We present the results via a comparative analysis where we look at the problem not only from a timeliness and accuracy of identification perspective, but also from the point of view of computational throughput. The analysis is based on simulation results using the sensor fusion system of a high performance fighter program. This system accomplishes the fusion of attribute data from a diverse set of sensors in a real time, computationally constrained processing environment. We will show some of the performance advantages evidential reasoning exhibits over a cumulative scoring approach. This is demonstrated on a typical scenario that the fighter in question has to show performance against. Furthermore, we will discuss a methodology for using a by-product of the evidential reasoning algorithm as a score to help in the data association task of assigning sensor reports to system tracks.

DTIC

Algorithms; Target Recognition; Robustness (Mathematics); Real Time Operation

20020045453 European Organization for Nuclear Research, LHCb Experiment, Geneva, Switzerland

Indexing and Selection of Data Items in Huge Data Sets by Constructing and Accessing Tag Collections

Ponce, Sebastien, European Organization for Nuclear Research, Switzerland; Vila, Pere Mato, European Organization for Nuclear Research, Switzerland; Hersch, Roger D., Ecole Polytechnique Federale de Lausanne, Switzerland; Tenth Goddard Conference on Mass Storage Systems and Technologies in Cooperation with the Nineteenth IEEE Symposium on Mass Storage Systems; April 2002, pp. 181-192; In English; Also announced as 20020045439; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

   We present here a new way of indexing and retrieving data in huge datasets having a high dimensionality. The proposed method speeds up the selecting process by replacing scans of the whole data by scans of matching data. It makes use of two levels of catalogs that allow efficient data preselections. First level catalogs only contain a small subset of the data items selected according to given criteria. The first level catalogs allow to carry out queries and to preselect items. Then, a refined query can be carried out on the preselected data items within the full dataset. A second level catalog maintains the list of existing first level catalogs and the type and kind of data items they are storing. We established a mathematical model of our indexing technique and show that it considerably speeds up the access to LHCb experiment event data at CERN (European Laboratory for Particle Physics).

Author

Mathematical Models; Data Management; Data Processing

20020045535 Air Force Inst. of Tech., Graduate School of Engineering and Management, Wright-Patterson AFB, OH USA

Selecting Salient Features in High Feature to Exemplar Ratio Conditions

Aslan, Ismail; Mar. 2002; 97p; In English; Original contains color images

Report No.(s): AD-A400572; AFIT/GOR/ENS/02-02; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

   We present an approach for identifying salient input features in high feature to exemplar ratio conditions. Basically we modify the SNR saliency-screening algorithm to improve the solution of the optimal salient feature subset problem. We propose that applying the SNR method to randomly selected subsets (SRSS) has a superior potential to identify the salient features than the traditional SNR algorithm has. Two experimental studies are provided to demonstrate the consistency of the SRSS. In the first experiment we used a noise-corrupted version of the Fisher s Iris classification problem. The first experiment designed to prove the fidelity of the SRSS method. The second application is a real-life industrial problem. The salient features of this dataset are

not known beforehand. We compared the performances of the salient feature subsets created by the traditional SNR and the SRSS method. We also realized that the SRSS algorithm improved the current solution to this industrial application.
DTIC
Algorithms; Graphical User Interface; Classifications

20020045545 Concord Associates, Inc., Herndon, VA USA
Development and Application of an Automated Data Analyzer *Final Report, May 1992-Sep. 1993*
Connelly, E. M.; Mar. 2002; 122p; In English
Contract(s)/Grant(s): MDA903-92-C-0085
Report No.(s): AD-A400503; ARI19932; ARI-RN-2002-07; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

   In order to seek and test determinants of unit effectiveness, the Automated Data Analyzer (ADA) was developed based on the idea that search and analysis of large amounts of data can be automated if variables can be converted into a standard form. In addition, the methodology permits an analyst to identify, in a first iteration, large sets of variables and associated parameters he/she thinks may be relevant to an issue, and assist in their refinement, combination, and elimination in later iterations. The ADA does this by providing a concise visual presentation of the relationships among a large number of variables. This facilitates identification of variables and combinations of variables, in complex data sets, that are related to mission outcomes and to each other. Project results show that the ADA analysis can be used to extract mission effectiveness information from the ARI National Training Center (NTC) data base for analyst review and automated data analysis. The method allows considerable flexibility allowing the analyst to adjust, modify, and create new analyses with some ease and flexibility. Use of analysis specification files allows automatic documentation and the repeated use of analyses. Complex analyses can be gradually built to assess company/team and task force (TF) performance.
DTIC
Computer Programs; Numerical Analysis; Analyzers

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20020044104 National Aerospace Lab., Amsterdam, Netherlands
Advanced Stochastic Method for Probabilistic Analysis
Grooteman, F. P.; Sep. 1999; 24p; In English
Report No.(s): PB2002-103223; NLR-TP-99398; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Recently at NLR a very efficient stochastic method has been implemented for probabilistic analysis. The method is a so-called Second-Order Reliability Method (SORM). The basis of the method is formed by an efficient optimization scheme applied to find the safety index (most probable point) after which second-order information is added to the solution by solving one of Tvedt's formulas. The optimization scheme is based on the approximate model concept, approximating the objective and constraints (limit-states) by means of second order Taylor series at some starting point. Next, the approximate model can be optimized using standard optimization techniques giving a better estimate of the optimum. Around this optimum a new approximate model is formed and optimized. These steps are repeated until the optimum has been found. Special features have been applied to minimize the number of expensive limit-state function evaluations and prevent oscillation of the solution. Furthermore, an efficient scheme has been implemented to transform non-normal dependent variables to a set of normal independent variables. The method has been implemented in a computer code called RAP (Reliability Analysis Program), which can be used on top of any existing deterministic program, e.g., finite element program or crack growth program. The accuracy, correct implementation and performance are demonstrated by two examples.
NTIS
Stochastic Processes; Statistical Analysis

20020044106 Boeing Co., Seattle, WA USA
Using Target Range Rate Data in Distributed Data Fusion Systems
Miller, Ronald H., Jr.; Jun. 20, 2000; 9p; In English
Report No.(s): AD-A400188; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

   Current data fusion architectures are evolving from single-platform, standalone systems to multi-platform, integrated systems. by taking advantage of the favorable geometry of a distributed data fusion system, target tracking performance can be greatly increased. Sensors can typically provide an estimation of a target's position, but only the radial component of the target's

velocity. The target's velocity is typically obtained by tracking a target over time and estimating both position and velocity by putting the correlated sensor reports through a kalman filter. This filtering can take on the order of minutes (depending on sensor update rates) in which time the target may have maneuvered, possibly causing the filtering process to restart. If the range rate information from multiple platforms is combined, target velocity can be estimated quicker and with greater accuracy. This velocity information can then be fed back to the individual platforms, allowing smaller correlation gates which will enable tracking in higher density scenarios. The drawback to this approach is an increase in the amount of data that needs to be communicated among the platforms. This paper considers the performance implications of four different multi-platform architectures: sharing the best track, fusing all of the tracks, fusing all of the sensor reports, and fusing sensor reports that contain range rate information. The metrics that will analyzed are: track initiation time, velocity accuracy, and communication message bandwidth.
DTIC
Distributed Processing; Multisensor Fusion; Tracking (Position); Autonomy

20020044504 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Method for Selecting the Right Air Force Supplier
DI Risio, Hugo G.; Mar. 2002; 82p; In English; Original contains color images
Report No.(s): AD-A400203; AFIT/GLM/ENS/02-04; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

   The purpose of this Thesis is to apply Statistical Tools to the Selection Process of Air Force Suppliers in order to verify the existence of significant differences among them. A new comparative method is introduced to provide Air Force logisticians with a specific tool to assure that a complete and fair analysis is performed when several suppliers seem to be in the same condition in front of a bid. The searching for the best value in satisfying the Air Force need when an important amount of money is involved and its desires for having scientific support to explain in court if it were necessary, the nature of differences among selected supplier offers find in this method the solution for and old and systematic problem. This method includes the definition of several attributes that will be scored. This scoring process is the operationalization of the study constructs. Suppliers attributes represent aspects that are closely related to the Air Force interest areas when material or service requirements have to be satisfied. These attributes will be weighted in accordance with their relative importance and will constitute the base for the Comparison Process. The method involves the use of several statistical tools as well as a procedure to verify the aptitude of the statistical model.
DTIC
Statistical Analysis; Armed Forces; Supplying; Military Operations

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20020044540 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands
Conditions for beta-Perfectness
Keijsper, J. C. M.; Tewes, M.; Aug. 2000; 26p; In English
Report No.(s): PB2002-102925; MEMO-1537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   A beta-perfect graph is a simple graph G such that x(G') for every induced subgraph G' of G, where x(G') is the chromatic number of G', and B(G') is defined as the maximum over all induced subgraphs H of G' of the minimum vertex degree in H. The vertices of a B-perfect graph G can be coloured with x(G) colours in polynomial time (greedily). The main purpose of this paper is to give necessary and sufficient conditions, in terms forbidden induced subgraphs, for a graph to be B-perfect. We give new sufficient conditions and make improvements to sufficient conditions previously given by others. We also mention a necessary condition which generalizes the fact that no B-perfect graph contains an even hole.
NTIS
Numbers; Graph Theory; Chromates

20020044541 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands
Linear Bilevel Problems: Genericity Results and an Efficient Method for Computing Local Minima
Frederiks, T. J.; Still, G. J.; Aug. 2000; 28p; In English
Report No.(s): PB2002-102926; MEM0-1538; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The paper is concerned with linear bilevel problems. These nonconvex problems are known to be NP-complete. So, no efficient method for solving the global bilevel problem can be expected. In this paper we give a genericity analysis of linear bilevel

problems and present a new algorithm for computing efficiently local minimizers. The method is based on the given structural analysis and combines ideas of the Simplex method with projected gradient steps.
NTIS
Linearity; Computation; Minima

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20020045217 Army Research Lab., Sensors and electron devices directorate, Adelphi, MD USA
Transformation Properties of the Lagrangian and Eulerian Strain Tensors *Final Report, Dec. 1999-Apr. 2000*
Bahder, Thomas B.; Apr. 2002; 33p; In English
Report No.(s): ADA400671; ARL-TR-908; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A coordinate independent derivation of the Eulerian and Lagrangian strain tensors of finite deformation theory is given based on the parallel propagator, the world function, and the displacement vector field as a three-point tensor. The derivation explicitly shows that the Eulerian and Lagrangian strain tensors are two-point tensors, each a function of both the spatial and material coordinates. The Eulerian strain is a two-point tensor that transforms as a second rank tensor under transformation of spatial coordinates and transforms as a scalar under transformation of the material coordinates. The Lagrangian strain is a two-point tensor that transforms as a scalar under transformation of spatial coordinates and transforms as a second rank tensor under transformation of the material coordinates. These transformation properties are needed when transforming the strain tensors from one frame of reference to another moving frame.
DTIC
Lagrangian Function; Tensors; Transformations (Mathematics); Coordinates; Euler Equations of Motion; Stress-Strain Relationships

20020045511 Notre Dame Univ., IN USA
A Novel Computational Approach to Combustion Modelling *Final Report, Feb. 1998-30 Jun. 2001*
Paolucci, Samuel, Notre Dame Univ., USA; Powers, Joseph M., Notre Dame Univ., USA; Jun. 2001; 26p; In English
Contract(s)/Grant(s): F49620-98-1-0206
Report No.(s): AD-A400632; AFRL-SR-BL-TR-02-0143; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A novel Wavelet Adaptive Multilevel Representation (WAMR) algorithm combined with an extended Intrinsic Low Dimensional Manifold (ILDM) approach to solve challenging multiscale problems has been developed. The emphasis of this work was the development of a combined algorithm to rationally reduce to lower dimensions the differential equations that model unsteady, multi-dimensional combustion processes. In particular, there was a focus on problems in which there is full coupling between fluid mechanics and chemical kinetics. Such problems are characterized by a multiplicity of phenomena evolving over length and time scales which are widely disparate. Results are shown for a resolved viscous one-dimensional detonation in hydrogen/oxygen/argon with detailed kinetics. The method has been extended to multiple dimensions, and results are shown for flow in a lid-driven cavity at high Reynolds number.
DTIC
Combustion; Differential Equations; Computation; Models

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20020044132 Vrije Univ., Amsterdam, Netherlands
Quasifree Spin-Dependent Electron Scattering from a Polarized He-3 Internal Target
Poolman, H. R.; Jan. 15, 1999; 176p; In English
Report No.(s): PB2002-103710; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Since the discovery of the He-3 isotope in 1930 it received relatively little attention, until Kastler developed the technique of optical pumping twenty years later. Especially during the last two decades the application of He-3 has found its way into many fields of science outside atomic, solid-state, and nuclear physics. In this thesis we study its nuclear structure using spin-dependent electron scattering of polarized electrons from He-3 polarized with the optical pumping technique.

NTIS

Electron Scattering; Helium Isotopes; Nuclear Structure

20020045498 Urals A. M. Gorky State Univ., Sverdlovsk, USSR

Short-Pitch Periodically Poled Lithium-Niobate and Lithium Tantalate *Final Report, 1 May-31 Oct. 1999*

Shur, Vladimir Y., Urals A. M. Gorky State Univ., USSR; Oct. 31, 1999; 64p; In English; Original contains color images

Contract(s)/Grant(s): F61775-99-WE037

Report No.(s): AD-A400691; SPC-99-4037; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Ural State University as follows: The contractor will further investigate the back-switched poling method for periodic domain patterning with shorter domain periods in thick lithium niobate and lithium tantalate substrates.

DTIC

Lithium Niobates; Tantalum Compounds; Ferroelectricity

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20020045236 Virginia Polytechnic Inst. and State Univ., Dept. of Mechanical Engineering, Blacksburg, VA USA

Analytical Modeling of Herschel-Quincke Concept Applied to Inlet Turbofan Engines*, Jan. 1999 - Dec. 2000*

Hallez, Raphael F., Virginia Polytechnic Inst. and State Univ., USA; Burdisso, Ricardo A., Virginia Polytechnic Inst. and State Univ., USA; March 2002; 106p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-2137; RTOP 706-81-12-01

Report No.(s): NASA/CR-2002-211429; NAS 1.26:211429; VPI-ENGR-4-26483; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report summarizes the key results obtained by the Vibration and Acoustics Laboratories at Virginia Tech over the period from January 1999 to December 2000 on the project 'Investigation of an Adaptive Herschel-Quincke Tube Concept for the Reduction of Tonal and Broadband Noise from Turbofan Engines', funded by NASA Langley Research Center. The Herschel-Quincke (HQ) tube concept is a developing technique the consists of circumferential arrays of tubes around the duct. The analytical model is developed to provide prediction and design guidelines for application of the HQ concept to turbofan engine inlets. An infinite duct model is developed and used to provide insight into attenuation mechanisms and design strategies. Based on this early model, the NASA-developed TBIEM3D code is modified for the HQ system. This model allows for investigation of the HQ system combined with a passive liner.

Author

Engine Inlets; Mathematical Models; Turbofan Engines; Noise Reduction

20020045380 Washington State Univ., Pullman, WA USA

Geometrical Aspects of Scattering and Physical Effects of Sound *Final Report, Jul. 1992-Dec. 2001*

Marston, Philip L.; Mar. 2002; 28p; In English

Contract(s)/Grant(s): N00014-92-J-1600

Report No.(s): AD-A400699; N00014-92-J-1600-FR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Research is reported into the causes of various scattering enhancements from a variety of targets in water including cylindrical and spherical metallic shells, circular plates, solid cylinders, and plastic or rubber targets for various shapes. Some of the enhancements are relevant to interpreting sonar images. Quantitative ray theory was developed to predict the observed scattering amplitudes. Acoustic holography was used to confirm the modeled plate response. Measurement methods developed include: wide bandwidth acoustic sources, helicoidal acoustic wave sources, and magnetic methods for exciting torsional and flexural

modes. Other research concerned the acoustics of suspended particles and caustics and related research on light scattering and bubbles.

DTIC

Acoustic Scattering; Acoustical Holography; Light Scattering; Sound Waves; Cylindrical Bodies

20020045525 NASA Langley Research Center, Hampton, VA USA

Flow and Noise Control: Review and Assessment of Future Directions

Thomas, Russell H., NASA Langley Research Center, USA; Choudhari, Meelan M., NASA Langley Research Center, USA; Joslin, Ronald D., Pennsylvania State Univ., USA; April 2002; 96p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 781-10-12-01

Report No.(s): NASA/TM-2002-211631; L-18172; NAS 1.15:211631; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Technologies for developing radically new aerovehicles that would combine quantum leaps in cost, safety, and performance benefits with environmental friendliness have appeared on the horizon. This report provides both an assessment of the current state-of-the-art in flow and noise control and a vision for the potential gains to be made, in terms of performance benefit for civil and military aircraft and a unique potential for noise reduction, via future advances in flow and noise technologies. This report outlines specific areas of research that will enable the breakthroughs necessary to bring this vision to reality. Recent developments in many topics within flow and noise control are reviewed. The flow control overview provides succinct summaries of various approaches for drag reduction and improved maneuvering. Both exterior and interior noise problems are examined, including dominant noise sources, physics of noise generation and propagation, and both established and proposed concepts for noise reduction. Synergy between flow and noise control is a focus and, more broadly, the need to pursue research in a more concurrent approach involving multiple disciplines. Also discussed are emerging technologies such as nanotechnology that may have a significant impact on the progress of flow and noise control.

Author

Noise Reduction; Aerospace Engineering; Aerospace Vehicles; Flow Distribution; Control Systems Design

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20020045395 Fairfield Univ., Dept. of Physics, CT USA

Optimizing Performance of Far-Infrared Photoconductors: New Approach for Interpretation and Calibration of Transient Response *Final Report, 1 Aug. 1999 - 31 Jan. 2002*

Haegel, Nancy M., Fairfield Univ., USA; [2002]; 5p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goals of the proposed work were to determine if final steady state current values for Ge:Ga photoconductors could be predicted from the initial fast component of the transient response and to develop algorithms to operationalize this approach. This required transient measurements as a function of photon background and signal sizes, for both single shot and modulated signals. In addition, we proposed to address the nature of the hook response and the effects of non-equilibrium background fluctuations.

Derived from text

Algorithms; Photoconductors; Transient Response; Computerized Simulation

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20020045547 Texas A&M Univ., Dept. of Physics, College Station, TX USA

Publications/Patents/Presentations/Honors/Students Report: Modification of Mossbauer Spectra by Laser Radiation
Final Report
Kocharovskaya, Olga; Hasan, Zameer; Carroll, James; Jan. 2002; 27p; In English
Contract(s)/Grant(s): N00014-00-1-0371
Report No.(s): AD-A400506; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   This document contains a listing of publications, patents filed, presentations given, and detailed description and status of the experimental research on modification of Mossbauer spectra by laser radiation.
DTIC
Gamma Rays; Laser Beams; Mossbauer Effect; Rare Earth Compounds

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20020044136 Colorado Univ., USA
High Resolution X-ray Imaging *Final Report*
Cash, Webster, Colorado Univ., USA; Jan. 14, 2002; 4p; In English
Contract(s)/Grant(s): NAG5-5020; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
   NAG5-5020 covered a period of 7.5 years during which a great deal of progress was made in x-ray optical techniques under this grant. We survived peer review numerous times during the effort to keep the grant going. In 1994, when the grant started we were actively pursuing the application of spherical mirrors to improving x-ray telescopes. We had found that x-ray detectors were becoming rapidly more sophisticated and affordable, but that x-ray telescopes were only being improved through the intense application of money within the AXAF program. Clearly new techniques for the future were needed. We were successful in developing and testing at the HELSTF facility in New Mexico a four reflection coma-corrected telescope made from spheres. We were able to demonstrate 0.3 arcsecond resolution, almost to the diffraction limit of the system. The community as a whole was, at that time, not particularly interested in looking past AXAF (Chandra) and the effort needed to evolve. Since we had reached the diffraction limit using non-Wolter optics we then decided to see if we could build an x-ray interferometer in the laboratory. In the lab the potential for improved resolution was substantial. If synthetic aperture telescopes could be built in space, then orders of magnitude improvement would become feasible. In 1998 NASA, under the direction of Dr Nick White of Goddard, started a study to assess the potential and feasibility of x-ray interferometry in space. My work became of central interest to the committee because it indicated that such was possible. In early 1999 we had the breakthrough that allowed us build a practical interferometer. by using flats and hooking up with the Marshall Space Flight Center facilities we were able to demonstrate fringes at 1.25keV on a one millimeter baseline. This actual laboratory demonstration provided the solid proof of concept that NASA needed. As the year progressed the future of x-ray astronomy jelled around the Maxim program. Maxim is a set of two major x-ray astronomy missions based on the concepts I developed and demonstrated under this SR&T grant. The first Maxim is to image the sky at 100 micro-arcsecond resolution. That is one thousand times higher resolution than Hubble. The full Maxim has the ultimate goal of imaging the event horizon of a black hole in an active galactic nucleus (ALAN). This will require 0.1 micro-arcsecond resolution - one million times higher than Hubble! Nonetheless, using the techniques developed under this grant, it has become possible. Maxim Pathfinder is now in the NASA planning for a new start in approximately 20 10. The full Maxim is carried as a vision mission for the post 2015 timeframe. Finally, this grant is the evolved version of the SR&T grant we carried during the 1980s and up to 1994. At that point in time this grant was also working on x-ray optics, but concentrating on x-ray spectroscopy. The techniques developed by 1990 were not chosen for use on Chandra or XMM-Newton because they were too new. During the last year, however, the Constellation-X mission recognized the need for better spectroscopy techniques and tapped our expertise. We

were able to support the initial work on Con-X through this program. It now appears that the off-plane mount will be used in Con-X, increasing performance and decreasing cost and risk.

Author

X Ray Imagery; X Ray Astronomy; X Ray Telescopes; X Ray Optics

20020044821 Smithsonian Astrophysical Observatory, Cambridge, MA USA

A Focal Plane Stellar X-Ray Polarimeter for SXG *Annual Report, 1 May 2001 - 30 Apr. 2002*

Kaaret, P., Smithsonian Astrophysical Observatory, USA; April 2002; 1p; In English

Contract(s)/Grant(s): NAG5-9743; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Stellar X-Ray Polarimeter (SXRP) is the only X-ray polarimeter designed to view astrophysical sources that is currently scheduled to be flown. The SXRP is one of eight astronomical X-ray instruments that intended to be flown at the focal plane of the two SODART large-area metal-foil grazing-incidence X-ray telescopes on the Russian Spectrum-Roentgen-Gamma (SRG) mission. The engineering model of the SXRP was delivered to Russia in February 1994. Construction of the flight model (FM) is complete. The SXRP-FM is currently in storage at the Smithsonian Astrophysical Observatory and will be delivered when required.

Derived from text

Polarimeters; X Ray Imagery; X Ray Astronomy

20020044829 NASA Marshall Space Flight Center, Huntsville, AL USA

Ultralightweight Space Deployable Primary Reflector Demonstrator

Montgomery, Edward E., IV, NASA Marshall Space Flight Center, USA; Zeiders, Glenn W., Sirius Group, USA; [2002]; 4p; In English; 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 21-25 Apr. 2002, Denver, CO, Denver, CO, Denver, CO, Denver, CO, USA, USA, USA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A concept has been developed and analyzed and several generational prototypes built for a gossamer-class deployable truss for a mirror or reflector with many smaller precisely-figured solid elements attached will, for at least the next several decades, minimize the mass of a large primary mirror assembly while still providing the high image quality essential for planet-finding and cosmological astronomical missions. Primary mirror segments are mounted in turn on ultralightweight thermally-formed plastic panels that hold clusters of mirror segments in rigid arrays whose tip/tilt and piston would be corrected over the scale of the plastic panels by the control segments. Prototype panels developed under this program are 45 cm wide and fabricated from commercially available Kaplan sheets. A three-strut octahedral tensegrity is the basis for the overall support structure. Each fundamental is composed of two such octahedrons, rotated oppositely about a common triangular face. Adjacent modules are joined at the nodes of the upper and lower triangles to form a deployable structure that could be made arbitrarily large. A seven-module dowel-and-wire prototype has been constructed. Deployment techniques based on the use of collapsing toggled struts with diagonal tensional elements allows an assembly of tensegrities to be fully collapsed and redeployed. The prototype designs will be described and results of a test program for measuring strength and deformation will be presented.

Author

Segmented Mirrors; Panels; Prototypes; Trusses

20020045390 Alabama Agricultural and Mechanical Univ., Office of Research and Development, Normal, AL USA

Electro-Optic Modulator Based on Organic Planar Waveguide Integrated with Prism Coupler *Final Report, 1 Jun. 1999 - 30 May 2002*

Sarkisov, Sergey S., Alabama Agricultural and Mechanical Univ., USA; [2002]; 44p; In English

Contract(s)/Grant(s): NAG8-1498; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of the project, as they were formulated in the proposal, are the following: (1) Design and development of novel electro-optic modulator using single crystalline film of highly efficient electro-optic organic material integrated with prism coupler; (2) Experimental characterization of the figures-of-merit of the modulator. It is expected to perform with an extinction ratio of 10 dB at a driving signal of 5 V; (3) Conclusions on feasibility of the modulator as an element of data communication systems of future generations. The accomplishments of the project are the following: (1) The design of the electro-optic modulator based on a single crystalline film of organic material NPP has been explored; (2) The evaluation of the figures-of-merit of the electro-optic modulator has been performed; (3) Based on the results of characterization of the figures-of-merit, the conclusion

was made that the modulator based on a thin film of NPP is feasible and has a great potential of being used in optic communication with a modulation bandwidth of up to 100 GHz and a driving voltage of the order of 3 to 5 V.

Derived from text

Couplers; Data Transmission; Electro-Optics; Modulators; Waveguides; Optical Communication

20020045537 Air Force Research Lab., Hanscom AFB, MA USA

Characterization of a Hyperspectral Imager

Mooney, Jonathan M.; Ewing, William S.; Jan. 1998; 10p; In English

Report No.(s): AD-A400556; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A spectral imager constructs a three dimensional (two spatial and one spectral) image from a series of two dimensional images. This paper discusses a technique for spectral imaging that multiplexes the spatial and spectral information on a staring focal plane, then demultiplexes the resulting imagery to obtain the spectral image. This approach has high optical throughput and is robust to focal plane array (FPA) nonuniformities. This presentation is the third in a series to the IRIS passive sensors community. Previously we introduced the hardware and discussed the reconstruction algorithm in detail. Here we review the hardware and present experimental results.

DTIC

Demultiplexing; Algorithms; Imagery

20020045538 Massachusetts Inst. of Tech., Machine Intelligence Technology Group, Lexington, MA USA

Opponent-Color Fusion of Multi-Sensor Imagery: Visible, IR and SAR

Waxman, A. M.; Aguilar, M.; Baxter, R. A.; Fay, D. A.; Ireland, D. B.; Jan. 1998; 20p; In English; Original contains color images

Contract(s)/Grant(s): F19628-95-C-0002

Report No.(s): AD-A400557; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary motivation for multi-sensor image fusion is to combine the complementary information derived from different modality sensors. Building on the work reported in two of our earlier papers from IRIS Passive Sensors 1996, we show how opponent-color processing and center-surround shunting neural networks can be used to develop a variety of image fusion architectures. By emulating single-opponent color processing cells in the retina, and double-opponent color cells in primary visual cortex, we demonstrate an effective strategy for color image fusion as applied to: low-light visible and thermal IR fusion for color night vision, 6-band multispectral fusion for camouflage detection, EO/IR/SAR multi-modal fusion from separate sensor platforms. We have also developed a realtime visible/IR fusion processor from multiple C80 DSP chips using commercially available boards, and use it in conjunction with the Lincoln Lab low-light CCD and an uncooled IR camera. Limited human factors testing of visible/IR fusion has shown improved human performance using our color fused imagery as compared to alternative fusion strategies or either single image modality alone. We conclude that fusion architectures which match opponent-sensor contrasts to human opponent-color pathways will yield fused image products of high image quality and utility.

DTIC

Image Processing; Charge Coupled Devices; Human Factors Engineering; Multisensor Applications; Color

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20020045504 Keio Univ., Dept. of Electroics and Electrical Engineering, Yokahama, Japan

Future TCAD System for Nanometer-Scale-Device Manufacturing Using Plasma Etching

Makabe, Toshiaki; Masui, Jun; Maeshige, Kazunobu; Jul. 09, 2000; 12p; In English; Original contains color images; See Also ADM001341, Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia, 9-14 July 2000., From 9 Jul 2000 to 14 Jul 2000 --Original contains color plates: All DTIC reproductions will be in black and white

Report No.(s): AD-A400739; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present stage of a series of numerical modelings of the plasma etching processes is overviewed. Physical, chemical and electrical linkage among modules describing low temperature plasma structure/function in a reactor, the profile and local charging evolution in a hole/trench, and electrical device damage during etching will make it possible to prepare a technology computer aided design (TCAD) for the practical purpose of prediction and designing the etching process. This system will also help to determine device arrangement and size in system on a chip (SoC) in a closed integration system. TCAD will also provide a tool

for discussing the etching processes between process engineers and device designers in the age of nanometer-scale device technology.
DTIC
Computer Aided Design; Computer Aided Manufacturing; Atmospheric Temperature

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20020044826 NASA Marshall Space Flight Center, Huntsville, AL USA
Beer Law Constants and Vapor Pressures of HgI2 over HgI2(s,l)
Su, Ching-Hua, NASA Marshall Space Flight Center, USA; Zhu, Shen, Universities Space Research Association, USA; Ramachandran, N., Universities Space Research Association, USA; Burger, A., Fisk Univ., USA; Journal of Crystal Growth; 2002; ISSN 0022-0248; Volume 235, pp. 313-319; In English; Copyright; Avail: Issuing Activity

Optical absorption spectra of the vapor phase over HgI2(s,l) were measured at sample temperatures between 349 and 610 K for wavelengths between 200 and 600 nm. The spectra show the samples sublimed congruently into HGI2 without any observed Hg or I2 absorption spectra. The Beer's Law constants for 15 wavelengths between 200 and 440 nm were derived. From these constants the vapor pressure of HgI2, P, was found to be a function of temperature for the liquid and the solid beta-phases: $\ln P(atm) = -7700/T(K) + 12.462$ (liquid phase) and $\ln P(atm) = -10150/T(K) + 17.026$ (beta-phase). The expressions match the enthalpies of vaporization and sublimation of 15.30 and 20.17 kcal/mole respectively, for the liquid and the beta-phase HgI2. The difference in the enthalpies gives an enthalpy of fusion of 4.87 kcal/mole, and the intersection of the two expressions gives a melting point of 537 K.
Author (revised)
Absorption Spectra; Enthalpy; Liquid Phases; Vapor Pressure; Mercury Compounds; Beer Law

20020045315 NASA Marshall Space Flight Center, Huntsville, AL USA
Magnetic Field Applications in Semiconductor Crystal Growth and Metallurgy
Mazuruk, Konstantin, NASA Marshall Space Flight Center, USA; Ramachandran, Narayanan, NASA Marshall Space Flight Center, USA; Grugel, Richard, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 40th Aerospace Sciences Meeting and Exhibit, 14 Jan. 2002, Reno, NV, USA
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

The Traveling Magnetic Field (TMF) technique, recently proposed to control meridional flow in electrically conducting melts, is reviewed. In particular, the natural convection damping capability of this technique has been numerically demonstrated with the implication of significantly improving crystal quality. Advantages of the traveling magnetic field, in comparison to the more mature rotating magnetic field method, are discussed. Finally, results of experiments with mixing metallic alloys in long ampoules using TMF is presented
Author
Crystal Growth; Magnetic Fields; Semiconductors (Materials); Metallurgy

20020045375 Boston Univ., Coll. of Engineering, Boston, MA USA
Enhancement of Deep Acceptor Activation in Semiconductors by Superlattice Doping *Final Report, 12 Jan. 1997-31 Dec. 2001*
Schubert, E. F.; Apr. 04, 2002; 18p; In English
Contract(s)/Grant(s): N00014-98-1-0194
Report No.(s): AD-A400478; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Gallium nitride (GaN) and related compounds are wide bandgap semiconductors suited for high power transistors and many other electronic and optoelectronic devices operating at high frequencies and elevated temperatures. A characteristic of GaN and related compounds is a high activation energy of acceptors, which leads to a low hole concentration in and high p-type resistivity of these materials. The present project proposed and demonstrated a novel approach to the well-known doping problem in GaN. This approach, called 'superlattice doping' uses thin layers of materials with different compositions and bandgap energies. As a result, acceptors exhibit a substantially higher activation and, as a result, the p-type conductivity is strongly enhanced. Under the project, AlGaN/GaN superlattices were demonstrated with resistivities that are a factor of ten lower than resistivities of p-type

GaN. The properties of the superlattices, including the design, acceptor activation energy, resistivity, temperature dependent hole concentration and mobility, spatial carrier distribution, and optical properties were investigated and the results are presented.
DTIC

Acceptor Materials; Activation Energy; Additives; Gallium Nitrides; Semiconductors (Materials); Superlattices; Semiconductor Devices

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020044536 National Science Council, Taipei, Taiwan, Province of China
National Science Council Review, 1998
2001; 208p; In English
Report No.(s): PB2002-103101; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

   In the face of the competition brought on by accelerating global trade liberalization, more demanding environmental protection requirements, and the impact of the emerging information society, science and technology have become crucial elements in the country's development into the next century. In order to realize the country's expectations, the NSC will vigorously promote national sci-tech development, support academic research, develop science-based industrial parks, and strengthen international sci-tech cooperation. The chief goal of this year's NSC Review is to summarize the NSC's administrative achievements and research results, and serve as a channel for communication between the government and the private sector, and between different government organizations.
NTIS

Environment Protection; Technologies; Research

20020045175 NASA Goddard Space Flight Center, Greenbelt, MD USA
Hyperspectral Technology Transfer to the US Department of Interior: Summary of Results of the NASA/DOI Hyperspectral Technology Transfer Project
Root, Ralph, Geological Survey, USA; Wickland, Diane, NASA Goddard Space Flight Center, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 331-342; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

   In 1997 the Office of Biological Informatics and Outreach (OBIO), Biological Resources Division, US Geological Survey and NASA, Office of Earth Science (OES), initiated a coordinated effort for applying Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) data and analysis, as a technology transfer project, to critical DOI environmental issues in four study sites throughout the USA. This work was accomplished by four US Department of the Interior (DOI) study teams with support from NASA/OES principal investigators and the Office of Earth Science programs. The studies, including personnel, objectives, background, project plans, and milestones were documented in a project website at <http://biology.usgs.gov/hsc>. This report summarizes the final outcomes of the project, detailing accomplishments, lessons learned, and benefits realized to NASA, the US Geological Survey, and the participating DOI bureaus.
Author

Technology Transfer; Resources Management; Information Transfer

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20020044500 Veridian Systems Div., Ann Arbor, MI USA
Data Fusion in Offensive and Defensive Information Operations
Waltz, Ed; Jan. 01, 2001; 15p; In English; Original contains color images
Report No.(s): AD-A400192; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   The conduct of offensive and defensive Information Operations (IO) require coordinated targeting and protection, respectively, across physical, information and even cognitive domains. Even the specific IO activities of Computer Network

Defense (CND) and Computer Network Attack (CNA) require the close coordination of activities across all three domains to encompass physical processing assets, information creation, flows and stores, and the cognitive behaviors of human network administrators and operators. This paper describes the role of data fusion to provide intelligence for IO and to conduct both offensive operations (OIO) and defensive operations (DIO). We build on prior papers that have introduced the concept of a three-domain model of IO targets, and the general application of data fusion to the more abstract functions of IO. These functions require the fusion of both quantitative and qualitative data (e.g. numerical and text data, respectively) to develop models of physical, symbolic and cognitive IO targets and situations. This paper describes conceptual implementations of data fusion structures to model and understand OIO and DIO targets within the domains of reality.

DTIC

Computer Networks; Information Resources Management; Data Flow Analysis; Multisensor Fusion; Protection

20020045154 Farr View Consulting, Boulder, CO USA

Analysis of AVIRIS Data: A Comparison of the Performance of Commercial Software with Published Algorithms

Farrand, William H., Farr View Consulting, USA; Proceedings of the Tenth JPL Airborne Earth Science Workshop; December 2001, pp. 125-131; In English; Also announced as 20020045138; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

An early handicap to the effective use of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data was a lack of appropriate software. With improvements to the AVIRIS sensor have also come improvements in the available software. While there are a variety of software packages currently in use, a review of the recent literature indicates that most users of AVIRIS data are using the commercial Environment for Visualizing Images (ENVI) software. The documentation provided with the ENVI software is generally quite adequate; however, specifics on how most processing routines are implemented are not provided. Moreover, the source code for ENVI routines are not readily available, thus the user who is curious about how certain algorithms are implemented is left with few options. The objective of this paper is to provide a comparison of how ENVI implementations of several mapping algorithms perform against implementations of those routines coded by the author from the original published algorithms. The mapping algorithms examined in this work are: linear spectral mixture analysis, constrained energy minimization/matched filtering, and band mapping. The ENVI routines used were from ENVI version 3.4 software release.

Author

Algorithms; Computer Programs; Spectral Mixture Analysis; Comparison

20020045319 Department of Defense, Inspector General Dept., Arlington, VA USA

Information System Security: Air Force Web Site Administration, Policies, and Practices

Mar. 13, 2002; 22p; In English

Report No.(s): AD-A400513; IG/DOD-D-2002-062; No Copyright; Avail: CASI; A03, Hardcopy

This report is one in a series that address Internet access, practices, and policies. Subsequent reports will cover Web site administration within the Army and DoD. The Naval Audit Service plans to issue a separate report based on the audit of Web site administration within the Navy and the Marine Corps. This report evaluates Internet access, practices, and policies for Air Force Web site administration. In April 2001, the Air Force issued Transmission of Information Via the Internet, Air Force Instruction 33-129. Air Force Instruction 33-129 defines the roles and responsibilities of personnel establishing, revising, and operating an Internet Web site. It prohibits the display of classified and sensitive information on publicly accessible Air Force Web sites, and it requires annual reviews to ensure compliance to Air Force and DoD policy. Air Force Instruction 33-129 also requires major Air Force commands and wing level commanders to register their Web sites with Air Force Link that serves as a registration database for data into the Government Information Locator Service. The Government Information Locator Service helps citizens identify, locate, and retrieve information about their government.

DTIC

Information Systems; Data Transmission; Internets

20020045481 Army War Coll., Carlisle Barracks, PA USA

Army Knowledge Management (AKM): Challenges Ahead

Bryant, Jackie J.; Jan. 2002; 35p; In English

Report No.(s): AD-A400781; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Challenges exist in the areas of information technology and knowledge sharing throughout the Army. Organizations have tremendous amounts of information on computers but find it hard to share the information or knowledge outside of their community. Army Knowledge Management (AKM) is the answer to this challenge and provides the Army strategy to transform itself into a network-centric, knowledge-based force. AKM is an integrated, systematic approach to identifying, managing, and sharing virtually all of the Army's information assets, including databases, documents, policies and procedures, as well as

previously unarticulated expertise and experience resident in individual workers. This paper centers on the problem of knowledge sharing and the protection of information networks in the Army. It begins with the challenges we face today in the areas of information technology and knowledge sharing. It reiterates knowledge sharing in our senior leadership's strategies, joint visions, and quadrennial review. It covers the importance of learning from our commercial industry counterparts. It communicates the Army's leadership vision, involvement, purpose, and goals of AKM. Finally, the paper addresses the challenges and recommended solutions for knowledge sharing and the protection of information networks through information assurance (IA).
DTIC
Information Systems; Information Management

20020045509 Silver Image Management, Scottsdale, AZ USA
Defense Virtual Library: Technical Metadata for the Long-Term Management of Digital Materials: Preliminary Guidelines *Final Report*
Flynn, Marcy; Mar. 01, 2002; 127p; In English
Contract(s)/Grant(s): SP4600-01-P-0152
Report No.(s): AD-A400761; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
    Long-term preservation of digital information is one of the most critical challenges facing the information community. No single technology will meet that challenge. However, there is agreement that whatever technology, or technologies, may be adopted, success will depend on the availability of adequate metadata describing the technical characteristics of the digital materials being preserved. This report, prepared by Silver Image Management (SIM), proposes technical metadata elements appropriate for digital objects in the Defense Virtual Library (DVL). DVL is a collaborative effort of the Defense Technical Information Center, the Defense Advanced Research Projects Agency (DARPA) and the Corporation for National Research Initiatives (CNRI).
DTIC
Data Management; Digital Data; Preserving

84
LAW, POLITICAL SCIENCE AND SPACE .POLICY

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20020045494 RAND Corp., Santa Monica, CA USA
The Future of the Information Revolution in Europe: Proceedings of an International Conference
Hundley, Richard O.; Anderson, Robert H.; Bikson, Tora K.; Botterman, Maarten; Cave, Jonathan; Jan. 2001; 123p; In English
Report No.(s): AD-A400741; CF-172-NIC; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
    The information revolution is bringing about profound changes in many aspects of life. RAND has undertaken a multi-year effort, sponsored by the National Intelligence Council (NIC), to chart the future course of these changes all over the world. As a major part of this effort, RAND is holding a series of international conferences on various aspects of the information revolution. The fourth conference in this series, cosponsored by the NIC (USA), the Defence Evaluation and Research Agency (UK), and the International Relations and Security Network (Switzerland), is reported on here. It was held in Limelette, Belgium, in April 2001 and focused on the information revolution in Europe. Its objective was to gain an European perspective on all aspects of the information revolution.
DTIC
International Relations; Charts

89
ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20020044429 Smithsonian Astrophysical Observatory, Cambridge, MA USA
BeppoSAX Observations of MKN 110 *Final Report, 15 May 2001 - 14 May 2002*
Nicastro, Fabrizio, Smithsonian Astrophysical Observatory, USA; May 2002; 1p; In English
Contract(s)/Grant(s): NAG5-10814; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Mkn 110 is a bright, nearby Seyfert 1 galaxy, which underwent a long optical monitoring campaign, during the past 12 years. Optical observations show that Mkn 110 vary, both in flux and spectral shape. The intensity and width of its Broad Emission Lines (BELs) also vary, from typical Seyfert 1, to typical Narrow Line Seyfert 1 (NLSy1) values, so suggesting that this could be the first supermassive black holes where accretion state related transitions, as frequently observed in stellar-size black holes, have finally been observed. To verify these suggestions we asked to monitor Mkn 110 with BeppoSAX with three 50 ksec observations six months apart. The goal of the proposal was to observe spectral variations in X-ray, already suggested by previous, existing ROSAT (Roentgen Satellite) and ASCA (Advanced Satellite for Cosmology and Astrophysics) observations of the same source. The first of these three SAX (Satellite per Astronomia X) observations was taken on May 2000, and lacks the Low-Energy instrument (0.1-2 keV is the band in which NLSy1 and Sy1 X-ray spectra differ most).
Derived from text
Seyfert Galaxies; Visual Observation; X Ray Spectra

20020044956 NASA Marshall Space Flight Center, Huntsville, AL USA
Serendipitous Detections of XTE J1906+09 with the Rossi X-Ray Timing Explorer
Wilson, Colleen A., NASA Marshall Space Flight Center, USA; Finger, Mark H., Universities Space Research Association, USA; Gogus, Ersin, Alabama Univ., USA; Woods, Peter M., Universities Space Research Association, USA; Kouveliotou, Chryssa, NASA Marshall Space Flight Center, USA; The Astrophysical Journal; Feb. 01, 2002; Volume 565, pp. 1150-1160; In English; Copyright; Avail: Issuing Activity

The 89 s X-ray pulsar XTE J1906+09 was discovered during Rossi X-Ray Timing Explorer (RXTE) observations of SGR 1900+14 in 1996. Because of monitoring campaigns of SGR 1900+14, XTE J1906+09 was also monitored regularly in 1996 September, 1998 May-June, 1998 August-1999 July, and 2000 March-2001 January. A search for pulsations resulted in detections of only the two previously reported outbursts in 1996 September and 1998 August-September. Pulsed flux upper limits for the rest of the observations show that XTE J1906+09 is a transient X-ray pulsar and likely has a Be star companion. The RXTE all-sky monitor did not reveal XTE J1906+09. Pulse-timing analysis of the second outburst discovered a sinusoidal signature in the pulse frequencies that is likely produced by an orbital periastron passage. Fits to pulse phases using an orbital model and quadratic phase model have chi(exp 2) minima at orbital periods of 26-30 days for fixed mass functions of 5, 10, 15, and 20 solar masses. The pulse shape showed energy- and intensity-dependent variations. Pulse-phase spectroscopy quantified the energy-dependent variations. The phase-averaged spectrum used the pulse minimum spectrum as the background spectrum to eliminate effects from SGR 1900+14 and the Galactic ridge and was well fitted by an absorbed power law with a high-energy cutoff with column density N(sub H) = 6 +/- 1 x 10(exp 22)/sq cm, a photon index of 1.01 +/- 0.08, cutoff energy E(sub cut) = 11 +/- 1 keV, and e-folding energy E(sub fold) = 19 +/- 4 keV. Estimated 2-10 keV peak fluxes, corrected for contributions from the Galactic ridge and SGR 1900+14, are 6 x l0(exp -12) and 1.1 x 10(exp -10) ergs/sq cm/s for the 1996 and 1998 outbursts, respectively. XTE J1906+09 may be part of an unusual class of Be/X-ray binaries that do not lie on the general spin period versus orbital period correlation with the majority of Be/X-ray binaries.
Author (revised)
Pulsars; X Ray Binaries; X Ray Astronomy; Spectrum Analysis

20020045310 Vanguard Research, Inc., Astronomy and Astrophysics, Scotts Valley, CA USA
IRAS Low Resolution Spectra of Asteroids *Final Report*
Cohen, Martin, Vanguard Research, Inc., USA; Walker, Russell G., Vanguard Research, Inc., USA; Apr. 16, 2002; 25p; In English
Contract(s)/Grant(s): NASW-99025
Report No.(s): VRISV-1140-001-Final-Report; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Optical/near-infrared studies of asteroids are based on reflected sunlight and surface albedo variations create broad spectral features, suggestive of families of materials. There is a significant literature on these features, but there is very little work in the thermal infrared that directly probes the materials emitting on the surfaces of asteroids. We have searched for and extracted 534 thermal spectra of 245 asteroids from the original Dutch (Groningen) archive of spectra observed by the IRAS Low Resolution Spectrometer (LRS). We find that, in general, the observed shapes of the spectral continua are inconsistent with that predicted by the standard thermal model used by IRAS. Thermal models such as proposed by Harris (1998) and Harris et al.(1998) for the near-earth asteroids with the "beaming parameter" in the range of 1.0 to 1.2 best represent the observed spectral shapes. This implies that the IRAS Minor Planet Survey (IMPS, Tedesco, 1992) and the Supplementary IMPS (SIMPS, Tedesco, et al., 2002) derived asteroid diameters are systematically underestimated, and the albedos are overestimated. We have tentatively identified

several spectral features that appear to be diagnostic of at least families of materials. The variation of spectral features with taxonomic class hints that thermal infrared spectra can be a valuable tool for taxonomic classification of asteroids.
Author

Asteroids; Near Infrared Radiation; Albedo; Infrared Spectra; Surveys

20020045501 Dynacon Enterprises Ltd., Downsview, Ontario Canada
NESS: A Dual-Use Microsatellite for Asteroid Detection/Tracking, and Satellite Tracking R and D
Carroll, Kieran A., Dynacon Enterprises Ltd., Canada; Hildebrand, Alan R., Calgary Univ., Canada; Apr. 03, 2001; 12p; In English; Original contains color images; See Also ADM001334. Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. --Original contains color plates: All DTIC reproductions will be in black and white. Prepared in coope
Report No.(s): AD-A400709; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Near Earth Space Surveillance (NESS) mission is being developed by Dynacon and a team of asteroid scientists, supported by the Canadian Space Agency (CSA) and Defence R and D Canada (DRDC). NESS uses a single satellite to perform a dual mission: searching for and tracking Earth-approaching asteroids, and tracking satellites in Earth orbit. There are aspects of both of these activities that are best accomplished using an orbiting observatory. The concept presented here is to implement NESS using a small imaging telescope mounted on a low-cost microsatellite-class platform, based on the design developed for the MOST stellar photometry microsatellite mission.
DTIC

Asteroid Detection; Microsatellites; Satellite Tracking; Earth Orbits; Surveillance

20020045517 Naval Observatory, Washington, DC USA
Astrometric Data Sources For Space Surveillance and Space Control
Urban, Sean E.; Apr. 03, 2001; 30p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held in Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images. Contains viewgraphs only
Report No.(s): AD-A400585; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

How much devoted to a priori data? Systems moving toward higher accuracies - a priori data accuracies become important. Should utilize best data. Best changes: allow for updates. Factors of 100 for same star not uncommon.
DTIC

Astronomy; Stars

20020045534 NASA Marshall Space Flight Center, Huntsville, AL USA
Galactic SNR Candidates in the ROSAT All-Sky Survey
Schaudel, Daniel, Max-Planck-Inst. fuer Extraterrestrische Physik, Germany; Becker, Werner, Max-Planck-Inst. fuer Extraterrestrische Physik, Germany; Voges, Wolfgand, Max-Planck-Inst. fuer Extraterrestrische Physik, Germany; Reich, Wolfgang, Max-Planck-Inst. fuer Radioastronomie, Germany; Weisskopf, Martin, NASA Marshall Space Flight Center, USA; [2001]; 4p; In English; Seminar on Neutron Stars and Pulsars, 21-25 Jan. 2002, Bad Honnef, Germany; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Identified radio supernova remnants (SNRS) in the Galaxy comprise an incomplete sample of the SNR population due to various selection effects. ROSAT performed the first all-sky survey with an imaging X-ray telescope, and thus provides another window for finding SNRS and compact objects that may reside within them. Performing a search for extended X-ray sources in the ROSAT all-sky survey database about 350 objects were identified as SNR candidates in recent years. Continuing this systematic search, we have reanalyzed the ROSAT all-sky survey (BASS) data of these candidates and correlated the results with radio surveys like NVSS, ATNF, Molonglo, and Effelsberg. A further correlation with SIMBAD and NED were used for subsequent identification purpose. About 50 of the 350 candidates turned out to be likely galaxies or clusters of galaxies. We found 14 RASS sources which are very promising SNR candidates and are currently subject of further follow-up studies. We will provide the details of the identification campaign and present first results.
Author

Supernova Remnants; X Ray Astronomy; Sky Surveys (Astronomy); Identifying; X Ray Sources

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20020044095 Scripps Institution of Oceanography, San Diego, CA USA
Amino Acids and Other Organic Compounds in Antarctic Meteorites and Ice *Final Report, 1 Jun. 1997 - 31 May 2000*
Bada, Jeffrey L., Scripps Institution of Oceanography, USA; May 01, 2002; 5p; In English
Contract(s)/Grant(s): NAG5-4937
Report No.(s): Rept-97-1312; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
    Highly sensitive amino acid analyses were carried out on the Mars meteorites ALH84001 and Nakhla, the lunar meteorite MAC81005, the H5 chondrite LEW85320 and in Antarctic Allan Hills ice and sediments from the Nile delta. Measurements of amino acid abundance profiles and enantiomeric (D/L) ratios in these various meteorites in comparison to terrestrial samples where the meteorites fell provided an unambiguous way of determining that the amino acids detected in the Martian meteorites are terrestrial contaminants. Polycyclic aromatic hydrocarbons (PAHs) in ALH84001 and ice samples were also analyzed as was the carbon isotopic composition of the total organic carbon. The PAHs in ALH84001 are also probably terrestrial contaminants. However, the carbon isotopic composition of the total organic material in ALH84001 suggests that some martian organic material may be present but the likely source is the infall of meteoritic debris to the Martian surface.
Author
Amino Acids; Antarctic Regions; Chondrites; Ice; SNC Meteorites

20020044267 Search for Extraterrestrial Intelligence Inst., CA USA
Dust Trails of SP/Tuttle and the Unusual Outbursts of the Ursid Shower
Jenniskens, Peter; Lyytinen, E.; deLignie, M. C.; Johannink, C.; Jobse, K.; Schievink, R.; Langbroek, M.; Koop, M.; Gural, P.; Wilson, M.; [2001]; 44p; In English
Contract(s)/Grant(s): RTOP 344-50-92; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
    Halley-type comets tend to have a series of dust trails that remain spatially correlated for extended periods of time, each dating from a specific return of the comet. Encounters with 1 - 9 revolution old individual dust trails of 55P/Tempel-Tuttle have led to well recognized Leonid shower maxim, the peak time of which was well predicted by recent models. Now. we used the same model to calculate the position of dust trails of comet Shuttle, a Halley-type comet in an (approximately) 13.6 year orbit passing just outside of Earth's orbit. We discovered that the meteoroids tend to be trapped in the 14:12 mean motion resonance with Jupiter, while the comet librates in a slightly shorter period orbit around the 13:15 resonance. It takes six centuries to change the orbit enough to intersect Earth's orbit. During that time, the meteoroids and comet separate in mean anomaly by six years. thus explaining the unusual aphelion occurrences of Ursid outbursts. The resonances also prevent dispersion, so that the dust trail encounters (specifically, from dust trails of AD 1378 - 1405) occur only in one year in each orbit. We predicted enhanced activity on December 22, 2000, at around 7:29 and 8:35 UT (universal time) from dust trails dating to the 1405 and 1392 return, respectively. This event was observed from California using video and photographic techniques. At the same time, five Global-MS-Net stations in Finland, Japan and Belgium counted meteors using forward meteor scatter. The outburst peaked at 8:06:07 UT, December 22, at Zenith Hourly Rate (approx.) 90 per hour. The Ursid rates were above half peak intensity during 4.2 hours. This is only the second Halley type comet for which a meteor outburst can be dated to a specific return of the parent comet, and traces their presence back form 9 to at least 45 revolutions of the comet. New orbital elements of Ursid meteoroids are presented. We find that most orbits do scatter around the anticipated positions, confirming the link with comet Shuttle and the epoch of ejection. The 1405 and.1392 dust trails appear to have contributed similar amounts to the activity profile. Some orbits provide a hint of much older debris being present as well. Some of the dispersion in the radiant position may reflect a true variation in inclinations, with two groupings at low and high values, which is not understood at present.
Author
Comets; Meteoroids; Cosmic Dust; Comet Tails

20020044505 Karpov (V. Y.) Physical Chemistry Inst., Obninsk, Russia
Research Program For Radiation Stability of the Aerospace Materials Development of ISO Standards for Space Environment Simulation at Material Tests *Final Report*
Briskman, Boris A.; Jun. 15, 2000; 31p; In English; Original contains color images
Contract(s)/Grant(s): F61775-99-WE022
Report No.(s): AD-A400180; EOARD-SPC-99-4022; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Karpov Institute of Physical Chemistry as follows: The contractor will investigate experimental techniques and international standards for the long-term stability of materials subjected to the space environment. DTIC

Aerospace Environments; Spacecraft Construction Materials; Aircraft Construction Materials

20020044751 NASA Marshall Space Flight Center, Huntsville, AL USA

Bacterial Paleontology and Studies of Cardonaceous Chondrites

Gerasimenko, L. M., Academy of Sciences (Russia), Russia; Hoover, R. B., NASA Marshall Space Flight Center, USA; Rozanov, A. Y., Academy of Sciences (USSR), USSR; Zhegallo, E. A., Academy of Sciences (USSR), USSR; Zhmur, S. I., Academy of Sciences (USSR), USSR; Paleontological Journal; 1999; Volume 33, No. 4, pp. 439-459; In English

Contract(s)/Grant(s): RFBR-99-04-48806; RFBR-96-05-97821; RFBR-98-05-64765; RFBR-97-05-65069; Copyright; Avail: Issuing Activity

Model objects showing biomorphic structures that normally occur in extraterrestrial bodies are discussed. Biomorphic bodies observed in meteorites are described.

Author (revised)

Bacteria; Chondrites; Paleontology; Exobiology

20020045314 NASA Marshall Space Flight Center, Huntsville, AL USA

Optical Microvariability of Blazars

Ghosh, K. K., NASA Marshall Space Flight Center, USA; Kim, Chulhee, Chonbuk National Univ., Korea, Republic of; Ramsey, B. D., NASA Marshall Space Flight Center, USA; Soundararajaperumal, S., Indian Inst. of Astrophysics, India; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present the results of optical differential photometry of five blazers [PKS0219+428 (3C66A), PKS 0235+164 (AO 0235+16), H0414+019, PKS 0851+202 (OJ 187) and QSO 1807+698 (3C 371)] that were observed on 7 nights between November 05, 1997 and December 29, 1998, using the B and the V band filters. We have detected microvariations in four blazers (3C66A, AO 0235+16, H0414+019, and OJ 287). In addition, the light curve of AO 0235+16 has displayed a mini-flare when the brightness of this source was decreasing. Night-to-night variations have also been detected in 3C66A, H0414+019, and OJ 287. The results of our observations are discussed in the framework of accretion disk phenomena (magnetic flares or hot spots in accretion disks) and jet phenomena (plasma instabilities in jets).

Author

Blazars; Optical Measurement; Photometry; Variability

20020045316 NASA Marshall Space Flight Center, Huntsville, AL USA

Laboratory Studies of the Optical Properties and Condensation Processes of Cosmic Dust Particles

Abbas, Mian M., NASA Marshall Space Flight Center, USA; Craven, Paul D., NASA Marshall Space Flight Center, USA; Spann, James F., NASA Marshall Space Flight Center, USA; Tankosic, Dragana, Alabama Univ., USA; [2002]; 1p; In English; NASA Laboratory Astrophysics Workshop, 1-3 May 2002, San Jose, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A laboratory facility for levitating single isolated dust particles in an electrodynamics balance has been developing at NASA/Marshall Space Flight Center for conducting a variety of experimental, of astrophysical interest. The objective of this research is to employ this innovative experimental technique for studies of the physical and optical properties of the analogs of cosmic grains of 0.2-10 micron size in a chamber with controlled pressure/temperatures simulating astrophysical environments. In particular, we will carry out three classes of experiments to investigate the microphysics of the analogs of interstellar and interplanetary dust grains. (1) Charge characteristics of micron size single dust grains to determine the photoelectric efficiencies, yields, and equilibrium potentials when exposed to UV radiation. These measurements will provide the much-needed photoelectric emission data relating to individual particles as opposed to that for the bulk materials available so far. (2) Infrared optical properties of dust particles obtained by irradiating the particles with radiation from tunable infrared diode lasers and measuring the scattered radiation. Specifically, the complex refractive indices, the extinction coefficients, the scattering phase functions, and the polarization properties of single dust grains of interest in interstellar environments, in the 1-25 micron spectral region will be determined. (3) Condensation experiments to investigate the deposition of volatile gases on colder nucleated particles in dense interstellar clouds and lower planetary atmospheres. The increase in the mass or m/q ratio due to condensation on the particle will be monitored as a function of the dust particle temperature and the partial pressure of the injected volatile gas. The measured data wild permit determination of the sticking efficiencies of volatile gases of astrophysical interest. Preliminary

results based on photoelectric emission experiments on 0.2-6.6 micron size silica particles exposed to UV radiation in the 120-200 nm spectral region will be presented.
Author
Cosmic Dust; Optical Properties; Condensation; Astrophysics

20020045388 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Combinations of Earth Orientation Measurements: SPACE2001, COMB2001, and POLE2001
Gross, Richard S., Jet Propulsion Lab., California Inst. of Tech., USA; April 2002; 32p; In English
Contract(s)/Grant(s): NAS7-1407
Report No.(s): JPL-Publ-02-08; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   Independent Earth-orientation measurements taken by the space-geodetic techniques of lunar and satellite laser ranging, very long baseline interferometry, and the global positioning system have been combined using a Kalman filter. The resulting combined Earth-orientation series, SPACE2001, consists of values and uncertainties for Universal Time, polar motion, and their rates that span from September 28.0, 1976 to January 19.0, 2002 at daily intervals. The space-geodetic measurements used to generate SPACE2001 have been combined with optical astrometric measurements to form two additional combined Earth-orientation series: (1) COMB2001, consisting of values and uncertainties for Universal Time, polar motion, and their rates that span from January 20.0, 1962 to January 15.0, 2002 at five-day intervals, and (2) POLE2001, consisting of values and uncertainties for polar motion and its rates that span from January 20, 1900 to December 21, 2001 at 30.4375-day intervals.
Author
Earth Orientation; Kalman Filters; Geodesy; Earth Rotation; Time Measurement

20020045389 NASA Goddard Space Flight Center, Greenbelt, MD USA
Burst Oscillation Periods from 4U 1636-53: A Constraint on the Binary Doppler Modulation
Giles, A. B., Tasmania Univ., Australia; Hill, K. M., Tasmania Univ., Australia; Strohmayer, T. E., NASA Goddard Space Flight Center, USA; Cummings, N., NASA Goddard Space Flight Center, USA; [2002]; 30p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
   The burst oscillations seen during Type 1 X-ray bursts from low mass X-ray binaries (LMXB) typically evolve in period towards an asymptotic limit that likely reflects the spin of the underlying neutron star. If the underlying period is stable enough, measurement of it at different orbital phases may allow a detection of the Doppler modulation caused by the motion of the neutron star with respect to the center of mass of the binary system. Testing this hypothesis requires enough X-ray bursts and an accurate optical ephemeris to determine the binary phases at which they occurred. We present here a study of the distribution of asymptotic burst oscillation periods for a sample of 26 bursts from 4U 1636-53 observed with the Rossi X-ray Timing Explorer (RXTE). The burst sample includes both archival and proprietary data and spans more than 4.5 years. We also present new optical light curves of V801 Arae, the optical counterpart of 4U 1636-53, obtained during 1998-2001. We use these optical data to refine the binary period measured by Augusteijn et al. to 3.7931206(152) hours. We show that a subset of approx. 70% of the bursts form a tightly clustered distribution of asymptotic periods consistent with a period stability of approx. 1 x 10(exp -4). The tightness of this distribution, made up of bursts spanning more than 4 years in time, suggests that the underlying period is highly stable, with a time to change the period of approx. 3 x 10(exp 4) yr. This is comparable to similar numbers derived for X-ray pulsars. We investigate the period and orbital phase data for our burst sample and show that it is consistent with binary motion of the neutron star with v(sub ns) sin i is less than 38 and 50 km/s at 90 and 99% confidence, respectively. We use this limit as well as previous radial velocity data to constrain the binary geometry and component masses in 4U 1636-53. Our results suggest that unless the neutron star is significantly more massive than 1.4 solar masses the secondary is unlikely to have a mass as large as 0.36 solar masses, the mass estimated assuming it is a main sequence star which fills its Roche lobe. We show that a factor of 3 increase in the number of bursts with asymptotic period measurements should allow a detection of the neutron star velocity.
Author
Neutron Stars; X Ray Binaries; X Ray Astronomy; Stellar Oscillations

20020045391 Florida Univ., Office of Research and Graduate Education, Gainesville, FL USA
Dynamics of Solar System Dust *Final Report, 1 Mar. 1999 - 28 Feb. 2002*
Dermott, Stanley F., Florida Univ., USA; May 24, 2002; 6p; In English
Contract(s)/Grant(s): NAG5-4531; NAG5-11643; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
   The ongoing aim of the research is to investigate the dynamical and physical evolution of interplanetary dust particles in order to produce a detailed global model of the zodiacal cloud and its constituent components that is capable of predicting thermal fluxes

in mid-infrared wave bands to an accuracy of 1% or better; with the additional aim of exploiting this research as a basis for predicting structure in exozodiacal clouds that may be signatures of unseen planets.

Author

Solar System; Zodiacal Dust; Spatial Distribution; Evolution (Development)

20020045521 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

LINEAR System Performance Analysis

Evans, Jenifer B.; Apr. 2001; 29p; In English; Original contains color images; See Also ADM001334, Proceedings of the 2001 Space Control Conference (19th Annual) held at Lincoln Laboratory, Hanscom AFB, MA on 3-5 April 2001. The original document contains color images. Viewgraphs only

Report No.(s): AD-A400840; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Presentation on the performance of the Lincoln Near Earth Asteroid Research (LINEAR) system. Includes: Background; Performance Analysis-The big picture; Performance Analysis-The details; and Future work.

DTIC

Asteroids; Reliability Analysis; Linear Systems

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20020044431 NASA Johnson Space Center, Houston, TX USA

Modeling Grade IV Gas Emboli using a Limited Failure Population Model with Random Effects

Thompson, Laura A., Houston Univ.-Clear Lake, USA; Conkin, Johnny, National Space Biomedical Research Inst., USA; Chhikara, Raj S., Houston Univ.-Clear Lake, USA; Powell, Michael R., NASA Johnson Space Center, USA; May 2002; 46p; In English; The ISSO of the University of Houston provided basic funding support for Dr. Laura Thompson under the ISSO Post-Doctoral Fellowship Program. Partial support of her research was under research grant NAG9-1083 from the NASA JSC.

Contract(s)/Grant(s): NAG9-1083

Report No.(s): NASA/TP-2002-210781; S-891; NAS 1.60:210781; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

   Venous gas emboli (VGE) (gas bubbles in venous blood) are associated with an increased risk of decompression sickness (DCS) in hypobaric environments. A high grade of VGE can be a precursor to serious DCS. In this paper, we model time to Grade IV VGE considering a subset of individuals assumed to be immune from experiencing VGE. Our data contain monitoring test results from subjects undergoing up to 13 denitrogenation test procedures prior to exposure to a hypobaric environment. The onset time of Grade IV VGE is recorded as contained within certain time intervals. We fit a parametric (lognormal) mixture survival model to the interval-and right-censored data to account for the possibility of a subset of "cured" individuals who are immune to the event. Our model contains random subject effects to account for correlations between repeated measurements on a single individual. Model assessments and cross-validation indicate that this limited failure population mixture model is an improvement over a model that does not account for the potential of a fraction of cured individuals. We also evaluated some alternative mixture models. Predictions from the best fitted mixture model indicate that the actual process is reasonably approximated by a limited failure population model.

Author

Aeroembolism; Decompression Sickness; Goodness of Fit; Random Processes; Parameter Identification; Mathematical Models

20020044817 California Univ., Inst. of Geophysics and Planetary Physics, Los Angeles, CA USA

Wave Activity in Europa's Wake: Implications for Ion Pickup

Volwerk, M., California Univ., USA; Kivelson, M. G., California Univ., USA; Khurana, K. K., California Univ., USA; Journal of Geophysical Research; Nov. 01, 2001; ISSN 0148-0227; Volume 106, No. A11, pp. 26,033-26,048; In English; Original contains color illustrations

Contract(s)/Grant(s): JPL-958694; NAG5-7959

Report No.(s): Paper-2000JA000347; Copyright; Avail: Issuing Activity

   Intense wave power at frequencies near and below the cyclotron frequencies of heavy ions was detected in Europa's wake during the E11 and E15 flybys. The fluctuations are mainly transverse to the background magnetic field. Wave characteristics

indicate that they are ion cyclotron waves driven by positively charged pickup ions. In both flybys there is evidence, derived from the wave polarization, for pickup of negatively charged chlorine ions. When the moon is near the center of the Jovian current sheet, the pickup rate inferred for the E15 flyby is larger than that for the E11 flyby, when the moon is outside the Jovian current sheet. The wave power does not provide exact pickup density values because the waves are observed in regions where their growth has not yet fully developed. At the edges of the wake region, low-frequency (is less than K+ gyrofrequency) magnetohydrodynamic waves are also present. We identify magnetic field signatures that are reminiscent of interchange/ballooning of mass-loaded flux tubes from the wake/pickup region expanding into ambient medium that is less dense.
Author (revised)
Planetary Magnetic Fields; Wakes; Europa; Magnetohydrodynamic Waves

20020044818 California Univ., Inst. of Geophysics and Planetary Physics, Los Angeles, CA USA

Magnetized or Unmagnetized: Ambiguity Persists Following Galileo's Encounters with Io in 1999 and 2000

Kivelson, Margaret G., California Univ., USA; Khurana, Krishan K., California Univ., USA; Russell, Christopher T., California Univ., USA; Joy, Steven P., California Univ., USA; Volwerk, Martin, California Univ., USA; Walker, Raymond J., California Univ., USA; Zimmer, Christophe, California Univ., USA; Linker, Jon A., Science Applications International Corp., USA; Journal of Geophysical Research; Nov. 01, 2001; ISSN 0148-0227; Volume 106, No. A11, pp. 26,121-26,135; In English; Original contains color illustrations

Contract(s)/Grant(s): JPL-958694

Report No.(s): Paper-2000JA002510; Copyright; Avail: Issuing Activity

Magnetometer data from Galileo's close encounters with Io do not establish absolutely either the existence or absence of an internal magnetic moment because the measurements were made in regions where plasma currents contribute sizable magnetic perturbations. Data from an additional encounter where the closest approaches were made beneath Io's south polar regions, were lost. The recent passes enhance our understanding of the interaction of Io and its flux tube with the torus, and narrows the limits on possible internal sources of magnetic fields. Simple field-draping arguments account for some aspects of the observed rotations. Analyses in terms of both a magnetized and an unmagnetized Io are considered. Data from the February 2000 pass disqualify a strongly magnetized Io (surface equatorial field stronger than the background field) but do not disqualify a weakly magnetized Io (surface equatorial field of the order of Ganymede's but smaller than the background field at Io). Models imply that if Io is magnetized, its magnetic moment is not absolutely antialigned with the rotation axis. The inferred tilt is consistent with contributions from an inductive field on the order of those observed at Europa and Callisto. The currents would flow in the outer mantle or aesthenosphere if an induced field is present. Wave perturbations differing on flux tubes that do or do not link directly to Io and its ionosphere suggest the following: (1) the latter flux tubes are almost stagnant in Io's frame; and (2) a unipolar inductor correctly models the currents linking Io to Jupiter's ionosphere.
Author (revised)
Io; Planetary Magnetic Fields; Magnetic Flux; Planetary Ionospheres

20020044825 California Univ., Inst. of Geophysics and Planetary Physics, Los Angeles, CA USA

The Permanent and Inductive Magnetic Moments of Ganymede

Kivelson, M. G., California Univ., USA; Khurana, K. K., California Univ., USA; Volwerk, M., California Univ., USA; [2002]; 44p; In English

Contract(s)/Grant(s): JPL-958694; NAG5-7959

Report No.(s): UCLA-IGPP-Publ-5562; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Data acquired by the Galileo magnetometer on five passes by Ganymede have been used to characterize Ganymede's internal magnetic moments. Three of the five passes were useful for determination of the internal moments through quadrupole order. Models representing the internal field as the sum of dipole and quadrupole terms or as the sum of a permanent dipole field upon which is superimposed an induced magnetic dipole driven by the time varying component of the externally imposed magnetic field of Jupiter's magnetosphere give equally satisfactory fits to the data. The permanent dipole moment has an equatorial field magnitude 719 nT and is tilted by 176 degrees from the spin axis with the pole in the southern hemisphere rotated by 24 degrees from the Jupiter-facing meridian plane towards the trailing hemisphere. The data are consistent with an inductive response of a good electrical conductor of radius approximately 1 Ganymede radius. Although the data do not enable us to establish the presence of an inductive response beyond doubt, we favor the inductive response model because it gives a good fit to the data using only 4 parameters to describe the internal sources of fields, whereas the equally good dipole plus quadrupole fit requires 8 parameters. An inductive response is consistent with a buried conducting shell, probably liquid water with dissolved electrolytes, somewhere in the first few hundred km below Ganymede's surface. The depth at which the ocean is buried beneath the surface is somewhat uncertain, but our favored model suggests a depth of order 150 kilometers. As both temperature and pressure increase with depth

and the melting temperature of pure ice decreases to a minimum at approximately 170 kilometer depth, it seems possible that near this location, a layer of water would be sandwiched between layers of ice.

Author

Ganymede; Magnetic Moments; Magnetic Dipoles; Planetary Magnetic Fields

20020045311 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Near-Infrared Spectrophotometry of Phobos and Deimos

Rivkin, A. S., Arizona Univ., USA; Brown, R. H., Arizona Univ., USA; Trilling, D. E., Pennsylvania Univ., USA; Bell, J. F., III, Cornell Univ., USA; Plassmann, J. H., Arizona Univ., USA; Icarus; 2002; ISSN 0019-1035; Volume 156, pp. 64-75; In English

We have observed the leading and trailing hemispheres of Phobos from 1.65 to 3.5 micrometers and Deimos from 1.65 to 3.12 micrometers near opposition. We find the trailing hemisphere of Phobos to be brighter than its leading hemisphere by 0.24 plus or minus 0.06 magnitude at 1.65 micrometers and brighter than Deimos by 0.98 plus or minus 0.07 magnitude at 1.65 micrometers. We see no difference larger than observational uncertainties in spectral slope between the leading and trailing hemispheres when the spectra are normalized to 1.65 micrometers. We find no 3-micrometer absorption feature due to hydrated minerals on either hemisphere to a level of approximately 5-10% on Phobos and approximately 20% on Deimos. When the infrared data are joined to visible and nearby data obtained by previous workers, our data suggest the leading (Stickney-dominated) side of Phobos is best matched by T-class asteroids. The spectral slope of the trailing side of Phobos and leading side of Deimos are bracketed by the D-class asteroids. The best laboratory spectral matches to these parts of Phobos are mature lunar soils and heated carbonaceous chondrites. The lack of 3-micrometer absorption features on either side of Phobos argues against the presence of a large interior reservoir of water ice according to current models of Phobos' interior.

Author

Phobos; Deimos; Near Infrared Radiation; Spectrophotometry; Asteroids

20020045341 Tel-Aviv Univ., Ramat-Aviv, Dept. of Geophysics and Planetary Sciences, Tel-Aviv, Israel

Trapped Energetic Electrons in the Magnetosphere of Ganymede

Eviatar, Aharon, Tel-Aviv Univ., Ramat-Aviv, Israel; Williams, Donald J., Johns Hopkins Univ., USA; Paranicas, Chris, Johns Hopkins Univ., USA; McEntire, Richard W., Johns Hopkins Univ., USA; Mauk, Barry H., Johns Hopkins Univ., USA; Kivelson, Margaret G., California Univ., USA; Journal of Geophysical Research; Mar. 01, 2000; ISSN 0148-0227; Volume 105, No. A3, pp. 5547-5553; In English

On May 7, 1997, the Galileo orbiter flew through the magnetosphere of Ganymede and crossed flux tubes connected at both ends to the satellite. Energetic electrons, observed during this encounter by means of the Energetic Particle Detector on board Galileo, showed double loss cones and "butterfly" type pitch angle distributions, as has been noted in past publications. In addition, as the spacecraft flew toward Ganymede, both the shape and magnitude of the spectrum changed. The intensities decreased, with the greatest depletion observed at the lowest energies, and the monotonic slope characteristic of the Jovian environment was replaced by a rollover of the spectrum at the low-energy end. The spectra lead us to infer a strongly energy-dependent injection efficiency into the trapping region. As on previous encounters, the pitch angle distributions confirmed the position of the magnetopause as indicated by the magnetometer measurements, but the spectra remained Jovian until the trapping region was reached. Various physical mechanisms capable of generating the observed spectra and pitch angle distributions, including downstream reconnection insertion followed by magnetic gradient drift and absorption of the lowest-energy electrons by Ganymede and injection from Jovian flux tubes upstream are assessed.

Author

Energetic Particles; Ganymede; Electrons; Planetary Magnetospheres; Geophysics

20020045385 Massachusetts Inst. of Tech., Dept. of Earth, Atmospheric, and Planetary Sciences, Cambridge, MA USA

The Thermal Structure of Triton's Middle Atmosphere

Elliot, J. L., Massachusetts Inst. of Tech., USA; Strobel, D. F., Johns Hopkins Univ., USA; Zhu, X., Johns Hopkins Univ., USA; Stansberry, J. A., Lowell Observatory, USA; Wasserman, L. H., Lowell Observatory, USA; Franz, O. G., Lowell Observatory, USA; Icarus; 1999; ISSN 0019-1035; Volume 143, pp. 425-428; In English

The atmospheric structure of Triton in the altitude range 25-150 kilometers shows an unexpectedly steep thermal gradient of 0.26 K per kilometer above 50 kilometer altitude, with a nearly isothermal profile below. The upper part of the profile can be

explained by downward conduction of heat deposited by magnetospheric electrons and solar UV. However, the atmospheric temperature below 50 kilometers is too cold for identified radiative processes to dispose of the inferred heat flux (0.0012 erg per square centimeter per second) from the upper atmosphere. This implies that either the atmosphere is not in a steady state and/or an unidentified cooling mechanism is at work in the altitude range 25-50 kilometers. When extrapolated to the surface, the inversion results yield a pressure of 19.0 sup (+1.8) sub (-1.5), mubar, about 5mubar greater than that observed by Voyager.
Author

Triton; Planetary Atmospheres; Temperature Gradients; Thermal Conductivity

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20020044750 NASA Marshall Space Flight Center, Huntsville, AL USA

Correlation of the Coronal Mass Ejection Productivity of Solar Active Regions with Measures of their Global Nonpotentiality from Vector Magnetograms: Baseline Results

Falconer, D. A., Alabama Univ., USA; Moore, R. L., NASA Marshall Space Flight Center, USA; Gary, G. A., NASA Marshall Space Flight Center, USA; The Astrophysical Journal; Apr. 20, 2002; Volume 569, pp. 1016-1025; In English; Copyright; Avail: Issuing Activity

Conventional magnetograms and chromospheric and coronal images show qualitatively that the fastest coronal mass ejections (CMEs) are magnetic explosions from sunspot active regions where the magnetic field is globally strongly sheared and twisted from its minimum-energy potential configuration. We present measurements from active region vector magnetograms that start to quantify the dependence of an active region's CME productivity on the global nonpotentiality of its magnetic field. From each of 17 magnetograms of 12 bipolar active regions, we measured the size of the active region (the magnetic flux content, phi) and three separate measures of the global nonpotentiality (L(sub SS), the length of strong-shear, strong-field main neutral line: I(sub N), the net electric current connecting one polarity to the other; and alpha = (mu)I(sub N)/phi), a flux normalized measure of the field twist). From these measurements and the observed CME productivity of the active regions, we find that: (1) All three measures of global nonpotentiality are statistically correlated with the active region flux content and with each other; (2) All three measures of global nonpotentiality are significantly correlated with CME productivity. The flux content correlates with CME productivity, but at a lower statistically significant confidence level (less than 95%); (3) The net current is less closely correlated with CME productivity than alpha and the correlation of CME productivity with flux content is even weaker. If these differences in correlation strength, and a significant correlation of alpha with flux content, persist to larger active regions, this would imply that the size of active regions does not affect CME productivity except through global nonpotentiality; and (4) For each of the four global magnetic quantities, the correlation with CME productivity is stronger for a two-day time window for the CME production than for windows half as wide or twice as wide. This plausibly is a result of the most counterproductive active regions producing less than one CME per day, and from the active region's evolution often significantly changing the global nonpotentiality over the course of several days. These results establish that measures of active region global nonpotentiality from vector magnetograms (such as L(sub SS), I(sub N), and alpha) should be useful for prediction a active region CMEs.
Author (revised)

Coronal Mass Ejection; Solar Magnetic Field; Magnetic Signatures; Productivity

20020044827 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Laboratory Studies in UV and EUV Solar Physics *Annual Report, 1 Jun. 2001 - 31 May 2002*

Parkinson, W. H., Smithsonian Astrophysical Observatory, USA; April 2002; 1p; In English

Contract(s)/Grant(s): NAG5-9516; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Ion Beam Experiment at the Center for Astrophysics is dedicated to the study of ion-electron collision processes of importance in solar physics. The analysis of measurements of Electron Impact Excitation (EIE) from the 3s3p(exp 3)P(exp o) metastable state to the 3s3p(exp 1)P state of Si(2+) was completed during the past year and a paper describing the results is available as a preprint. Our current program is directed at measuring absolute cross sections for dielectronic recombination (DR) and EIE in Si(3+), one of the primary ions used for probing the solar transition region. Our study of DR is particularly concerned with the effects of electric and magnetic fields on the recombination rates. Measurements of silicon ions with charge greater than n=2 have necessitated upgrading the experiment with a new ion source. The new source is also suitable for producing C(2+) beams

to be used for measurements of EIE and DR for that system. The source is expected to be capable of producing beams of more highly charged systems as well.

Derived from text

Atomic Excitations; Electron Impact; Electron-Ion Recombination; Silicon; Solar Physics; Ions

20020044830 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Solar-System Tests of Gravitational Theories *Final Report, 1 Jan. 1998 - 31 Dec. 2001*

Shapiro, Irwin I., Smithsonian Astrophysical Observatory, USA; May 2002; 2p; In English

Contract(s)/Grant(s): NAG5-6832; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

    We are engaged in testing gravitational theory by means of observations of objects in the solar system. This work tests the equivalence principle (EP), the Shapiro time delay, the advances of planetary perihelion, the possibility of a secular variation G(dot) in the 'gravitational constant' G, and the rate of the de Sitter (geodetic) precession of the Earth-Moon system. We describe here the results under this contract.

Derived from text

Earth-Moon System; Gravitational Constant; Periodic Variations; Gravitational Effects

Subject Term Index

A

ABIOGENESIS, 68
ABSORPTION SPECTRA, 41, 106
ABUNDANCE, 14
ACCELERATION (PHYSICS), 59
ACCEPTOR MATERIALS, 107
ACOUSTIC SCATTERING, 102
ACOUSTICAL HOLOGRAPHY, 102
ACTIVATION, 72
ACTIVATION ENERGY, 107
ACTUATORS, 33
ADDITIVES, 107
ADSORPTION, 17, 44
AEROEMBOLISM, 115
AEROSOLS, 62
AEROSPACE ENGINEERING, 5, 19, 102
AEROSPACE ENVIRONMENTS, 7, 8, 113
AEROSPACE INDUSTRY, 19
AEROSPACE SYSTEMS, 6, 8
AEROSPACE VEHICLES, 55, 102
AGING (BIOLOGY), 75
AGRICULTURE, 43
AIR POLLUTION, 55
AIR QUALITY, 13
AIR TO AIR REFUELING, 4, 84
AIR TRAFFIC CONTROL, 1, 2
AIR WATER INTERACTIONS, 53, 54
AIRBORNE EQUIPMENT, 38, 46, 58
AIRCRAFT CONSTRUCTION MATERIALS, 113
AIRCRAFT ICING, 2
AIRCRAFT MAINTENANCE, 16
AIRCRAFT SAFETY, 2
AIRCRAFT STRUCTURES, 1, 3
AIRPORT PLANNING, 1
AIRSPACE, 2
ALBEDO, 111
ALGEBRA, 82
ALGORITHMS, 35, 39, 40, 45, 47, 58, 61, 63, 64, 65, 86, 89, 95, 97, 98, 103, 105, 108
ALTITUDE TESTS, 4
ALUMINUM, 14
ALUMINUM ALLOYS, 4
ALUMINUM OXIDES, 17
AMINO ACIDS, 56, 68, 112
AMORPHOUS MATERIALS, 27
ANALOG DATA, 83
ANALYZERS, 98

ANNUAL VARIATIONS, 53, 54
ANODES, 14
ANTARCTIC REGIONS, 112
ANTIBODIES, 67
ANTIGENS, 72
ANTIMISSILE DEFENSE, 31
APOPTOSIS, 73
APPLICATIONS PROGRAMS (COMPUTERS), 46, 58, 85, 95
ARC WELDING, 35
ARCHITECTURE (COMPUTERS), 82
ARID LANDS, 40
ARMED FORCES, 99
ASSAYING, 69
ASTEROID DETECTION, 111
ASTEROIDS, 60, 111, 115, 117
ASTRONOMY, 111
ASTROPHYSICS, 114
ATHLETES, 68
ATMOSPHERIC BOUNDARY LAYER, 56
ATMOSPHERIC CHEMISTRY, 96
ATMOSPHERIC COMPOSITION, 54
ATMOSPHERIC CORRECTION, 39, 40
ATMOSPHERIC EFFECTS, 63
ATMOSPHERIC MODELS, 8, 9, 58
ATMOSPHERIC MOISTURE, 48
ATMOSPHERIC SOUNDING, 60
ATMOSPHERIC TEMPERATURE, 106
ATOMIC ENERGY LEVELS, 33
ATOMIC EXCITATIONS, 119
ATTENUATION COEFFICIENTS, 61
AURORAL ZONES, 59
AUTONOMY, 3, 99

B

BACTERIA, 113
BEER LAW, 106
BIOCHEMISTRY, 14
BIODYNAMICS, 80
BIOELECTRICITY, 79
BIOGEOCHEMISTRY, 60
BIOINSTRUMENTATION, 14
BIOLOGICAL EVOLUTION, 60
BIOMARKERS, 67
BIPOLAR TRANSISTORS, 23
BLAZARS, 113
BLOOD, 67
BLOOD CIRCULATION, 78
BONES, 68

BOUNDARY CONDITIONS, 28
BOUNDARY LAYERS, 29
BOUNDARY VALUE PROBLEMS, 37
BRAIN, 73
BURNERS, 13

C

CADMIUM TELLURIDES, 13
CALIBRATING, 10, 31, 32, 39, 42
CANCER, 66, 67, 69, 70, 71, 72, 73, 74, 75, 76, 78
CARBON CYCLE, 54, 62
CARBON DIOXIDE, 54, 63
CARBON DIOXIDE CONCENTRATION, 58
CARBON TETRACHLORIDE, 38
CARBONATES, 60
CATALOGS (PUBLICATIONS), 9
CAVITATION FLOW, 28
CELL DIVISION, 74
CELLS (BIOLOGY), 70
CESIUM, 36
CHANNELS (DATA TRANSMISSION), 22, 88
CHARACTERIZATION, 27, 51, 57, 60
CHARGE COUPLED DEVICES, 105
CHARTS, 109
CHEMICAL ANALYSIS, 94
CHEMICAL REACTIONS, 16
CHILDREN, 77
CHIPS (ELECTRONICS), 24
CHLOROPHYLLS, 52
CHONDRITES, 60, 112, 113
CHROMATES, 100
CHROMIUM COMPOUNDS, 16
CHROMOSOMES, 69
CHUTES, 8
CIRRUS CLOUDS, 58
CITIES, 41, 49, 55
CLASSIFICATIONS, 15, 39, 41, 98
CLASSIFIERS, 15
CLIMATE CHANGE, 54
CLIMATE MODELS, 56, 62
CLIMATOLOGY, 53, 54, 63
CLINICAL MEDICINE, 69, 78
CLONING (BIOLOGY), 76
CLOSED CYCLES, 52
CLOUDS (METEOROLOGY), 56
COASTAL ZONE COLOR SCANNER, 61
CODING, 84

U

UNIX (OPERATING SYSTEM), 93
UNSTEADY FLOW, 28
UPPER ATMOSPHERE, 39
URINE, 80
USER MANUALS (COMPUTER PRO-
GRAMS), 3

V

VACCINES, 72
VAPOR DEPOSITION, 12, 16
VAPOR PRESSURE, 106
VARIABILITY, 41, 113
VEGETATION, 40, 42, 43, 44, 50
VEGETATION GROWTH, 68
VELOCITY DISTRIBUTION, 30
VESTIBULES, 67
VHSIC (CIRCUITS), 82
VIBRATION ISOLATORS, 35
VIBRATION MEASUREMENT, 35
VIDEO TAPES, 94
VIRTUAL REALITY, 81
VIRUSES, 71
VISCOUS FLOW, 26
VISUAL OBSERVATION, 110
VOLCANOES, 46
VORTEX INJECTORS, 10

W

WAKES, 116
WASTE UTILIZATION, 80
WATER COLOR, 61
WATER FLOW, 38
WATER POLLUTION, 38
WATER QUALITY, 38, 51
WATER RECLAMATION, 80
WATER VAPOR, 48
WAVEGUIDES, 105
WAVELENGTH DIVISION MULTI-
PLEXING, 25, 26
WAVELET ANALYSIS, 22
WEATHER FORECASTING, 56
WEIGHT (MASS), 80
WHEAT, 68
WIDE AREA NETWORKS, 93
WIND VELOCITY, 63
WINGS, 1
WIRE, 35
WIRELESS COMMUNICATION, 20

X

X RAY ASTRONOMY, 104, 110, 111,
114

X RAY BINARIES, 110, 114
X RAY IMAGERY, 104
X RAY OPTICS, 104
X RAY SOURCES, 111
X RAY SPECTRA, 110
X RAY TELESCOPES, 104
X-33 REUSABLE LAUNCH VEHICLE,
19

Z

ZINC TELLURIDES, 13
ZODIACAL DUST, 115

Personal Author Index

A

Abbas, Mian M., 113
Abbot, R., 9, 10
Abel, Peter, 64
Abelson, L. A., 86
Abernathy, Cammy R., 26
AbiliodeCarvalho, Osmar, Jr., 14, 15, 41, 43, 56
Abshire, J. B., 62
Adam, Nabil R., 91
Adams, Mitzi, 21
Adler-Golden, Steven M., 39
Africano, J. L., 10
Aguilar, M., 105
Aguilar, P. L., 45
Aiken, E. W., 3
Allamandola, Louis J., 56
Allen, Alex, 6
Altman, Amy L., 69
Amouzegar, Mahyar A., 6
Anderson, Gail, 39
Anderson, Robert H., 109
Andrews, A. E., 62
Andrews, J., 3
Annaballi, RonJon, 4
Arai, Kohei, 39
Arena, Andrew S., Jr., 1
Aronin, Neil, 73
Aslan, Ismail, 98
Asner, Gregory P., 40, 54
Atluri, Satya N., 37
Atluri, Vijayalakshmi, 91
Austin, R. W., 61, 62
Azagury, Alain, 92

B

Bada, Jeffrey L., 68, 112
Bagheri, Sima, 40
Bahder, Thomas B., 100
Balcius, James A., 69
Baldwin, J. D., 4
Baldwin, K. C., 17
Banachowski, Scott A., 90
Barnes, Robert, 64
Barth, J. A., 65
Basjes, N., 1
Batts, Glen W., 8
Baxter, R. A., 105
Bayley, Hagan, 77

Becker, Werner, 111
Behrenfeld, M. J., 62
Bell, J. F., III, 117
Bensel, Carolyn K., 79
Beratan, H. R., 22
Bernard, James E., 80
Bernards, Andre, 71
Bernbom, Gerry, 93
Bernstein, Lawrence S., 39
Bernstein, Max P., 56
Bhide, Anupam, 87
Bikson, Tora K., 109
Bingham, Gail, 67
Binzel, Richard P., 60
Birnie, Richard W., 44
Blaha, Milan, 33
Blodgett, D. W., 17
Blonski, Slawomir, 32
Blumenthal, Daniel J., 25
Boardman, J. W., 58
Bogucki, D. J., 65
Bolger, Graeme B., 76
Borchardt, Gary, 84
Borzuchowski, Janet, 94
Botterman, Maarten, 109
Bourne, N. K., 17
Bove, Dana, 15
Bowman, Bruce R., 8
Boxer, Robert B., 71
Brandt, Scott A., 90
Brannan, Camilynn T., 72
Branson, James I., 8
Breakefield, Xandra O., 77
Brei, Diann E., 32
Bretherton, Christopher S., 56
Breuer, Kenneth, 26
Brinckerhoff, W. B., 14
Briskman, Boris A., 112
Brown, James W., 64
Brown, R. H., 117
Brucker, G. J., 32
Bryant, Jackie J., 108
Bubenheim, David, 67
Burdisso, Ricardo A., 101
Burger, A., 106
Burke, Hsiao-Hua, 44
Burns, Randal, 90
Butler, Michelle L., 89

C

Calvin, Wendy M., 48, 50
Calvo, Sherri, 88
Camilletti, R., 23
Campbell, William F., 67
Canabal, Francisco, 27
Carman, John, 67
Carrasco, Nancy, 73
Carreiro, Louis G., 14
Carroll, James, 103
Carroll, Kieran A., 111
Cash, Webster, 103
Cave, Jonathan, 109
Chang, Peter A., III, 30
Chang, Tai-Sheng, 89
Chen, Gang, 20
Chen, Jeremy, 41
Cheng, A. F., 14
Chernova, Lola, 67
Chhikara, Raj S., 115
Chodosh, Lewis A., 71
Chou, Y. H., 84
Choudhari, Meelan M., 102
Chrien, Thomas, 31
Church, Stanley, 15
Clark, D. K., 61, 62
Clark, Roger, 15
Clark, Roger N., 45
Clemence, Lara, 88
Cochran, Joe, 17
Cohen, Martin, 110
Collatz, G. J., 62
Conkin, Johnny, 115
Connelly, E. M., 98
Cooper, George, 56
Cooper, John, 64
Coster, A. J., 9, 10
Cramer, J. M., 10
Craven, P. D., 58
Craven, Paul D., 113
Cruz Neira, Carolina, 80
Cummings, N., 114

D

Dachev, T. P., 32
daCostaMoreira, Romero, 41
Dalton, J. Brad, 15
Darwin, R.L., 20